I.1
4-28-03

# Current Conditions Report

## Premcor Refining Group, Inc.
## Hartford Refinery and River Dock
## Hartford, Illinois

**1190500002 – Madison County – ILD041889023**

*Volume 3 of 3*
*Appendices P through U*

Clayton Project No. 15-03095.00.001
April 28, 2003



*Prepared for:*
**THE PREMCOR REFINING GROUP, INC.**
**St. Louis, Missouri**

*Prepared by:*
**CLAYTON GROUP SERVICES, INC.**
**3140 Finley Road**
**Downers Grove, Illinois**
**630.795.3200**



Clayton℠
GROUP SERVICES

# APPENDIX P

## DOCUMENTS RELATED TO THE BULK STORAGE TANKS NORTH AREA

Clayton
GROUP SERVICES

# APPENDIX P-1

## TEL-CONTAMINATED DIRT

IPC 62 8/78

TO BE COMPLETED BY WASTE GENERATOR

**STATE OF ILLINOIS**
ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION CONTROL
2200 CHURCHILL ROAD, SPRINGFIELD, ILLINOIS 62706
(217) 782-6760
SPECIAL WASTE HAULING MANIFEST

0977960

Authorization Number ______

Clark Oil + Refining Corp. (Company Name) P.O. Box 7 (Address) 6182547301 (Phone Number) 1190500001 G (Generator Number)

Hartford (City) Illinois (State) 62048 (Zip) IL D041889023 (EPA Number)

WASTE HAULER(S)

Ashland Chemical Company (Hauler Name) 7710 Polk St. St. Louis, MO. 63111 (Hauler Address) S.W.H. Registration Number 1145002 ~~1200~~

3146387400 (Phone Number) MOD031005341 (EPA Number)

Hauler Name ______ Hauler Address ______ S.W.H. Registration Number ______

Phone Number ______ EPA Number ______

DESTINATION — DISPOSAL STORAGE OR TREATMENT SITE

Ashland Chemical Company (Facility Name) 7710 Polk Street (Address) 92918910 (Site Number)

St. Louis (City) MO. (State) 63111 (Zip) 3146387400 (Phone Number) MOD031005341 (EPA Number)

Alternate (Facility Name) ______ Address ______ Site Number ______

City ______ State ______ Zip ______ Phone Number ______ EPA Number ______

TO BE COMPLETED BY WASTE GENERATOR

WASTE NAME: Contaminated Dirt WASTE PHASE: Solid (Liquid, Gaseous, Solid)

THE SPECIAL WASTE BEING TRANSPORTED UNDER THIS MANIFEST IS OF THE DOT HAZARD CLASSIFICATION INDICATED IMMEDIATELY BELOW:

SHIPPING DESCRIPTION: TEL Contaminated Dirt HAZARD CLASS: ORM-E UN1649 (UN or NA Number) P110 ~~K052~~ (EPA HW Number)

WEIGHT FOR D.O.T. USE 2400 LBS / TONS (circle one) WEIGHT FOR I.E.P.A. USE MUST BE CONVERTED TO CU. YDS. OR GAL. QUANTITY OF WASTE DELIVERED: 000220 1 GALLONS 2 CU. YDS. (Circle One) 1

METHOD OF SHIPMENT (Circle One) (DRUMS 4 Number) TANK TRUCK OPEN TRUCK OTHER (Specify) ______

THIS IS TO CERTIFY THAT THE ABOVE-NAMED WASTE ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED, AND LABELED AND IS IN PROPER CONDITION FOR TRANSPORTATION, IN ACCORDANCE WITH THE APPLICABLE REGULATIONS OF THE ILLINOIS DEPARTMENT OF TRANSPORTATION AND I.E.P.A.

I HEREBY AGREE TO AND CERTIFY THE ABOVE WRITTEN INFORMATION Joe F. Bean Joe F. Bean (Authorized Signature) DATE: 7-18-84

WASTE HAULER

I HEREBY CERTIFY THAT THE ABOVE-DESCRIBED WASTE AND QUANTITY HAS BEEN ACCEPTED IN PROPER CONDITION FOR TRANSPORT AND I ACKNOWLEDGE THE DESTINATION AS INDICATED:

(1) Edward Sontag (Authorized Signature) DATE: 7/18/84

(2) ______ (Authorized Signature) DATE: __/__/__

DISPOSAL, STORAGE, OR TREATMENT FACILITY* HAZARDOUS WASTE SUBJECT TO FEE YES____ NO____

I HEREBY CERTIFY THAT THE ABOVE-DESCRIBED WASTE AND INDICATED QUANTITY HAS BEEN ACCEPTED AT THE SITE SPECIFIED ABOVE:

Jerry L Foster (Authorized Signature) DATE: 07/18/84

COMMENTS OR SPECIAL INSTRUCTIONS: ______

*24 HOUR EMERGENCY AND SPILL ASSISTANCE NUMBERS*

IN ILLINOIS: 217 / 782-3637 OUTSIDE ILLINOIS: 800 / 424-8802 or 202 / 426-2675

DISTRIBUTION: PART - 1 GENERATOR PART - 2 IEPA PART - 3 SITE PART - 4 HAULER PART - 5 IEPA PART 6 - GENERATOR

REV. # 4

**GENERATOR COPY — PART 1 - DO NOT REMOVE PART 1 FROM SET UNTIL COMPLETED.**

land Chemicals

# GENERATOR'S WASTE MATERIAL PROFILE SHEET

WASTE PROFILE SHEET CODE: ASH 42-0616
Clark Oil + Ref. Corp

**A GENERAL INFORMATION**

42-0616

GENERATOR NAME: Clark Oil + Refining Corp.

FACILITY ADDRESS: P.O. Box 7 Hawthorne St. North
Hartford, IL. 62048

TRANSPORTER:

TRANSPORTER PHONE:

GENERATOR USEPA I.D.: ILD041889023

GENERATOR STATE I.D.: 1190500001 G

TECHNICAL CONTACT: C.E. Knipping TITLE: Env. Engr. PHONE: 618-254-7301

NAME OF WASTE: Contaminated Dirt

PROCESS GENERATING WASTE: Leaking Pump Seal

**B PHYSICAL CHARACTERISTICS OF WASTE**

COLOR: Dark Brown

ODOR: ☐ NONE ☒ MILD ☐ STRONG DESCRIBE: TEL

PHYSICAL STATE @ 70°F: ☒ SOLID ☐ SEMI-SOLID ☐ LIQUID ☐ POWDER

LAYERS: ☐ MULTILAYERED ☐ BI-LAYERED ☒ SINGLE PHASED

FREE LIQUIDS: ☐ YES ☒ NO VOLUME %

pH: ☐ <2 ☐ 2-4 ☐ 4.1-6.9 ☐ 7 ☒ 7.1-10 ☐ 10.1-12.5 ☐ > 12.5 ☐ EXACT ☐ N/A

SPECIFIC GRAVITY: ☐ < .8 ☐ .8-1.0 ☐ 1.1-1.2 ☐ EXACT ☐ 1.3-1.4 ☐ 1.5-1.7 ☐ > 1.7

FLASH POINT: ☐ < 70°F ☐ 70°F-100°F ☐ 101°F-139°F ☐ 140°F-200°F ☒ > 200°F ☐ NO FLASH ☐ EXACT ☐ CLOSED CUP ☐ OPEN CUP

**C CHEMICAL COMPOSITION (TOTALS MUST ADD TO 100%)**

| | |
|---|---|
| TEL | 10-40 % |
| Kerosine | 5-10 % |
| Dirt | 60-80 % |

**D METALS** ☐ TOTAL (PPM) ☐ EPA EXTRACTION PROCEDURE (mg/l)

| | | | |
|---|---|---|---|
| ARSENIC (As) | <.005 | SELENIUM (Se) | <0.01 |
| BARIUM (Ba) | 0.19 | SILVER (Ag) | .009 |
| CADMIUM (Cd) | 0.027 | COPPER (Cu) | .041 |
| CHROMIUM (Cr) | .043 | NICKEL (Ni) | .026 |
| MERCURY (Hg) | .002 | ZINC (Zn) | .313 |
| LEAD (Pb) | 0.84 | THALLIUM (Tl) | N/A |
| CHROMIUM-HEX (Cr+6) | <0.015 | | |

**E OTHER COMPONENTS - TOTAL (PPM)**

CYANIDES: 0.30 PCB'S: 0
SULFIDES: 0.53 PHENOLICS: 1.68

**F SHIPPING INFORMATION**

D.O.T. HAZARDOUS MATERIAL? ☒ YES ☐ NO

PROPER SHIPPING NAME: TEL Contaminated Dirt

HAZARD CLASS: ORM-E I.D. NO. NA1649 R.Q.

METHOD OF SHIPMENT: ☐ BULK LIQUID ☐ BULK SOLID ☒ DRUM (TYPE/SIZE) 17H 55 Gal

ANTICIPATED VOLUME: GALS. 1.1 CUBIC YARDS OTHER

PER: ☒ ONE TIME ☐ WEEK ☐ MONTH ☐ QUARTER ☐ YEAR ☐

**G HAZARDOUS CHARACTERISTICS**

REACTIVITY: ☒ NONE ☐ PYROPHORIC ☐ SHOCK SENSITIVE ☐ EXPLOSIVE ☐ WATER REACTIVE ☐ OTHER

OTHER HAZARDOUS CHARACTERISTICS: ☒ NONE ☐ RADIOACTIVE ☐ ETIOLOGICAL ☐ PESTICIDE MANUFACTURING WASTE ☐ OTHER

USEPA HAZARDOUS WASTE? ☒ YES ☐ NO

USEPA HAZARDOUS CODE(S): ~~K052~~ P110

STATE HAZARDOUS WASTE? ☒ YES ☐ NO

STATE CODE(S): ~~K052~~ P110

**H SPECIAL HANDLING INFORMATION**

Treat as Toxic Wastes

☐ ADDITIONAL INFORMATION ATTACHED

I HEREBY CERTIFY THAT ALL INFORMATION SUBMITTED IN THIS AND ALL ATTACHED DOCUMENTS IS COMPLETE AND ACCURATE, AND THAT ALL KNOWN OR SUSPECTED HAZARDS HAVE BEEN DISCLOSED.

AUTHORIZED SIGNATURE: TITLE DATE

# APPENDIX P-2

## TANK 10-2

Kow 2/29/87 F1

Illinois Environmental Protection Agency · P. O. Box 19276, Springfield, IL 62794-9276

217/782-6761

Refer to: 1190500002 -- Madison County
Hartford/Clark Oil and Refining
ILD041889023
Compliance File

COMPLIANCE INQUIRY LETTER

Certified # P956 390 110

February 21, 1989

Clark Oil and Refining
Attn: Richard Thomas, Environmental Engineer
Post Office Box 7
Hartford, Illinois 62048

Dear Mr. Thomas:

The purpose of this letter is to address the status of the above-referenced facility in relation to the requirements of 35 Ill. Adm. Code Part(s) 722 and 725 and to inquire as to your position with respect to the apparent violations identified in Attachment A and your plans to correct these apparent violations. The Agency's findings of apparent non-compliance in Attachment A are based on an inspection completed on February 2, 1989. For your convenience a copy of the inspection report is enclosed with this letter.

Please submit in writing, within fifteen (15) calendar days of the date of this letter, the reasons for the identified violations, a description of the steps which have been taken to correct the violations and a schedule, including dates, by which each violation will be resolved. The written response, and two copies of all documents submitted in reply to this letter, should be sent to the following:

Angela Aye Tin, Manager
Technical Compliance Unit
Compliance Section
Illinois Environmental Protection Agency
Division of Land Pollution Control
2200 Churchill Road
Post Office Box 19276
Springfield, Illinois 62794-9276

Further, take notice that non-compliance with the requirements of the Illinois Environmental Protection Act and rules and regulations adopted thereunder may be the subject of enforcement action pursuant to either the Illinois Environmental Protection Act, Ill. Rev. Stat., Ch. 111 1/2, Sec. 1001 et seq. or the federal Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Sec. 6901 et seq.

If you have any questions regarding the above, please contact Mike Grant at 618/346-5120.

Sincerely,

Angela Aye Tin

Angela Aye Tin, Manager
Technical Compliance Unit
Compliance Section
Division of Land Pollution Control

AAT:MG:CLN:rd0657k/8-9

cc: Division File
Collinsville Region
Bruce Carlson
Chris Nifong

Attachment A

Pursuant to 35 Ill. Adm. Code 722.134(a), except as provided in subsections (d), (e) or (f), a generator may accumulate hazardous waste on-site for 90 days or less without a permit or without having interim status provided that:

1. The waste is placed in containers and the generator complies with 35 Ill. Adm. Code 725. Subpart I or the waste is placed in tanks and the generator complies with 35 Ill. Adm. Code 725. Subpart J except 35 Ill. Adm. Code 725.297(c) and 725.300. In addition, such a generator is exempt from all the requirements in 35 Ill. Adm. Code 725. Subparts G and H, except for 35 Ill. Adm. Code 725.211 and 725.214;

2. The date upon which each period of accumulation begins is clearly marked and visible for inspection on each container;

3. While being accumulated on-site, each container and tank is labeled or marked clearly with the words, "Hazardous Waste", and

4. The generator complies with the requirements for owners or operators in 35 Ill. Adm. Code 725 Subparts C (Preparedness and Prevention) and D (Contingency Plan and Emergency Procedures) and with 35 Ill. Adm. Code 725.116 (Personnel Training).

You are in apparent violation of 35 Ill. Adm. Code 722.134(a) in that item(s) 1 and 3 above was/were not complied with.

Specifically, the requirements of item 1 and/or 4 above (listed by regulation) which were not complied with, as well as the deficiencies observed, are:

A. Pursuant to 35 Ill. Adm. Code 725.293(a), in order to prevent the release of hazardous waste or hazardous constituents to the environment, secondary containment that meets the requirements of this Section must be provided (except as provided in subsections (f) and (g)).

   1. For all new tank systems or components, prior to their being put into service;

   2. For all existing tanks used to store or treat USEPA Hazardous Waste Numbers F020, F021, F022, F023, F026 and F027, as defined in 35 Ill. Adm. Code 721.131, within two years after January 12, 1987;

   3. For those existing tank systems of known and documentable age, within two years after January 12, 1987, or when the tank systems have reached 15 years of age, whichever come later;

   4. For those existing tank systems for which the age cannot be documented, within eight years of January 12, 1987; but if the age of the facility is greater than seven years, secondary containment must be provided by the time the facility reaches 15 years of age or within two years of January 12, 1987, whichever comes later; and

5. For tank systems that store or treat materials that become hazardous wastes subsequent to January 12, 1987, within the time intervals required in subsections (a)(1) through (a)(4), except that the date that a material becomes a hazardous waste must be used in place of January 12, 1987.

You are in apparent violation of 35 Ill. Adm. Code 725.293(a) for the following reason(s): As listed in item 4 above, secondary containment for Tank 10-2 was required to be installed by January 12, 1989, this containment has not been provided.

B. Pursuant to 35 Ill. Adm. Code 725.296, a tank system or secondary containment system from which there has been a leak or spill, or which is unfit for use, must be removed from service immediately. The owner or operator shall satisfy the following requirements:

a. Cease using; prevent flow or addition of wastes. The owner or operator shall immediately stop the flow of hazardous waste into the tank system or secondary containment system and inspect the system to determine the cause of the release.

b. Removal of waste from tank system or secondary containment system.

1. If the release was from the tank system, the owner or operator shall, within 24 hours after detection of the leak, remove as much of the waste as is necessary to prevent further release of hazardous waste to the environment and to allow inspection and repair of the tank system to be performed.

2. If the release was to a secondary containment system, all released materials must be removed within 24 hours to prevent harm to human health and the environment.

c. Containment of visible releases to the environment. The owner or operator shall immediately conduct a visual inspection of the release and, based upon that inspection:

1. Prevent further migration of the leak or spill to soils or surface water; and

2. Remove, and properly dispose of, any visible contamination of the soil or surface water.

You are in apparent violation of 35 Ill. Adm. Code 725.296 for the following reason(s): Visible contamination was observed within the earthen containment system for Tank 10-2, however the requirements of this Section have not been implemented, specifically the requirement of item c.2. listed above.

MG:rd0657k/10-11

EPA Number: ILD041889023 IEPA Number: 119050002

acility Name: Clark Oil and Refining Corp

reet: Hawthorne St P.O. Box 7

ty: Hartford Telephone: 618/254-7301

unty: Madison State: IL Zip Code: 62048

pe of Facility: Notified As: Generator Regulated As: Generator

F? yes __ no X HPV? yes __ no X 90 Day Follow-up Required? yes X no

gion: 6 Date of Inspection: 2/2/89 From: 10:00 to 11:45am

ather (LDF Only): ______

pe of Inspection

: X Sampling: __ Citizen Complaint: __ Closed: __ Withdrawal: __

ord Review: __ Follow-up to Inspection of ______: __ Other: __

Regulated Status

ll Quant. Gen:: __ Claimed Nonhandler: __ Other(Specify in narrative): __

ified As/Regulated As Matrix Number: 21 Key Letter: C

tification date, 8/18/80, from initial __ or subsequent __ notification.

t A date, 11/18/80, from initial __ or amended __ Part A: Withdrawn

t B permit application submitted? yes __ no X

s the firm been referred to: USEPA? yes __ no X; IAG? yes __ no X; Coun

tes Attorney? yes __ no X. Date of referral to USEPA: ______,

: ______, County States Attorney: ______.

eral Court Order Issued: ______ State Court Order Issued: ______

EPA Compliance Order Issued: ______ Illinois PCB Order Issued: ______

Facility Activity Summary

| ity(by s Code) | On Pt A | Activity Conducted Prior to 1980 | Was Activity Ever Done | Closed | Being Done at Time of Inspection | Exempt from Regulation per 35 IAC, Section: | On Annual Report For: 8_ | 8_ | 8_ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | RECEIVED | | | |
| | | | | | | FEB 14 1989 | | | |
| | | | | | | IEPA-DLPC | | | |
| | | | | | | | | | |
| | | | | | | | | | |

...reet: Hawthorne St. P.O. Box 7

...ty: Hartford State: IL Zip Code: 62048

...ner: Clark Oil & Refining Corp. Telephone #: 314/889-96...

...reet: 8182 Maryland Ave

...ty: St Louis State: MO Zip Code: 63105

| ...rson Interviewed | Title | Telephone # |
|---|---|---|
| Richard Thomas | Environmental Eng. | 618/254-730... |
| Joe Bean | Environmental Eng | 618/254-730 |
| | | |
| | | |
| | | |
| | | |

| ...spection Participants | Agency/Title | Telephone # |
|---|---|---|
| Mike Grant | IEPA/EPS | 618/346-512... |
| Wendy Schaufelberger | IEPA/EPS | 618/346-51... |
| | | |
| | | |
| | | |
| | | |

| ...pared By | Agency/Title | Telephone # |
|---|---|---|
| Michael D. Grant | IEPA/EPS | 618/346-5120 |

Summary of Apparent Violations

| ...rea | Class | Section | Area | Class | Section | Area | Class | Section |
|---|---|---|---|---|---|---|---|---|
| ...TH | I | 722.134(a)(1+3 | | | | | | |
| | Specifically | | | | | | | |
| | | 725.293(a) | | | | | | |
| | | 725.296 | | | | | | |
| | | | | | | | | |

WASTE DISP[illegible]TION FORM

cility Name: Clark Oil and Refining . USEPA #: ILD041889023 IEPA #: 1190500002

| aste Name nclude haz & n-haz special waste for ich no deter-nation has en made) | Generating Process (For waste gen. on site. N/A for TSD) | Date of Last Analysis | USEPA Haz Waste # | On 8700-12 * | On 3510-3 * | On Annual Rpt For 85 * | 86 * | 87 * | Amount On Site | Rate of Generation | Last Mani-fested Ship-ment | Disps |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DAF Float<br>Slop oil emulsion Solids<br>API Separator Sludge | WWT of Oily refinery wastewaters | Listed | K048<br>K049<br>K051 | Y | with-drawn | NOT shipped off-site | | | ~8800 Barrels (~360,000 gallons) | 6,000 gallons a week | N/A STORED 10-2 processed | in TANK until in Co[illegible] over[illegible] |
| Heat Exchanger bundle cleaning Sludge | Sludge from Heat Exchanger | Listed | K050 | Y | N/A | NOT shipped off-site | | | "0" | only during Turnaround of heat exchangers | N/A | on-site WW Trtmt plant |
| TANK BOTTOMS | Removed during Tank clean-outs. | All sludge (bottoms) is tested for lead. | K052 | Y | N/A | Yes | None generated | Yes | "0" | (Varies) during Tank cleanout only | 4/19/88 | BFI Winthrop Harbor |
| #1 Spent FCC Catalyst | Spent Catalyst from Cat Cracker | 12/19/88 | N/A<br>NON-HAZ | N/A | N/A | N/A | N/A | N/A | "0" | 50/100 yd3 every 2 months | 10/20/88 | GSX Barton #2 |
| API Separator Sludge | Sludge removed from bottom of API Separators | Listed | K051 | Yes | N/A | None generated | | | "0" | only generated during Turnaround (on API Maintenance) | 1/3/89 | LWI Calumet City, I[illegible] |
| Oily Wastewater Sludge | Wastewater treatment sludge | 11/3/88 | N/A<br>Non-Haz | N/A | N/A | N/A | N/A | N/A | 3-6,000 gallons | Hauled ~every other day | 2/02/89 | Peoria Dispos[illegible] |
| Activated Alumina | Turnaround on the Alky unit | 12/10/87 | D004 Failed Arsenic EP Tox | Y | N/A | NOT Generated during These Years | | | O | Generated during Turnaround of Alky unit | 2/19/88 | PDC |

1190500002 - Madison County
Hartford/Clark Oil and Refining
ILD041889023

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FEB 14 1989
IEPA-DLPC

Remarks

Clark Oil and Refining is currently processing 60,000 barrels of crude per day. The facility no longer produces leaded gasoline and all leaded gasoline has been removed from the facility. Per Mr. Thomas, during tank clean-outs, the sludge generated was tested for lead. If lead was detected, the waste was handled as K052. The last shipment of K052 was April 19, 1988. During our inspection, there was no K052 on-site. Other listed refinery wastes generated are DAF float - K048, Slop Oil Emulsion solids - K049, Heat Exchanger bundle cleaning sludge - K050, and API Separator Sludge - K051.

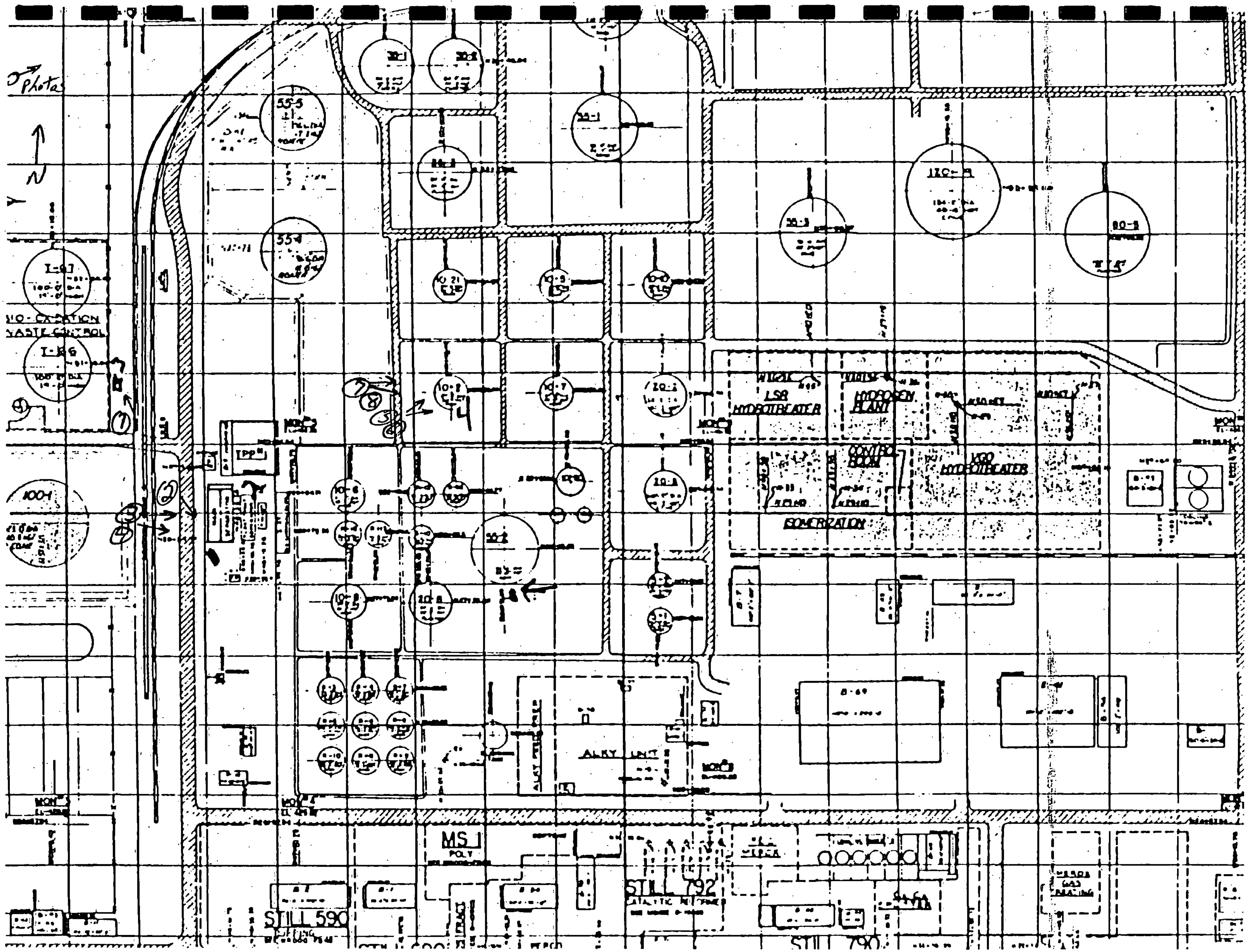
The K050 wastestream is only generated during turnaround on the heat exchangers. Turnaround refers to the process of shutting down a unit or process to provide necessary repairs and maintenance. This sludge is treated in the facility's on-site wastewater treatment permit. The K048, K049 and K051 wastestreams are reused to produce petroleum coke. These wastes are pumped to Tank 10-2 for temporary storage prior to being pumped to the Coker units. As a result, Tank 10-2 is classified as a storage tank. However, because the facility generated the waste and does not store the waste for greater than 90 days, a RCRA permit is not required. Not all K051 is reused in this manner. During turnaround, the heavier K051 sludge which settles to the bottom of the separator is removed and packaged for shipment off-site. This last shipment of the heavier sludge was shipped on January 3, 1989.

Other wastes are generated during periods of turnaround. The only other wastes generated routinely are the spent catalyst and wastewater treatment sludge. Both of these wastes are non-hazardous. The spent catalyst is shipped to GSX-Barton (SW Permit #841332) and the wastewater treatment sludge is shipped to Peoria Disposal Company (SW Permit #941676).

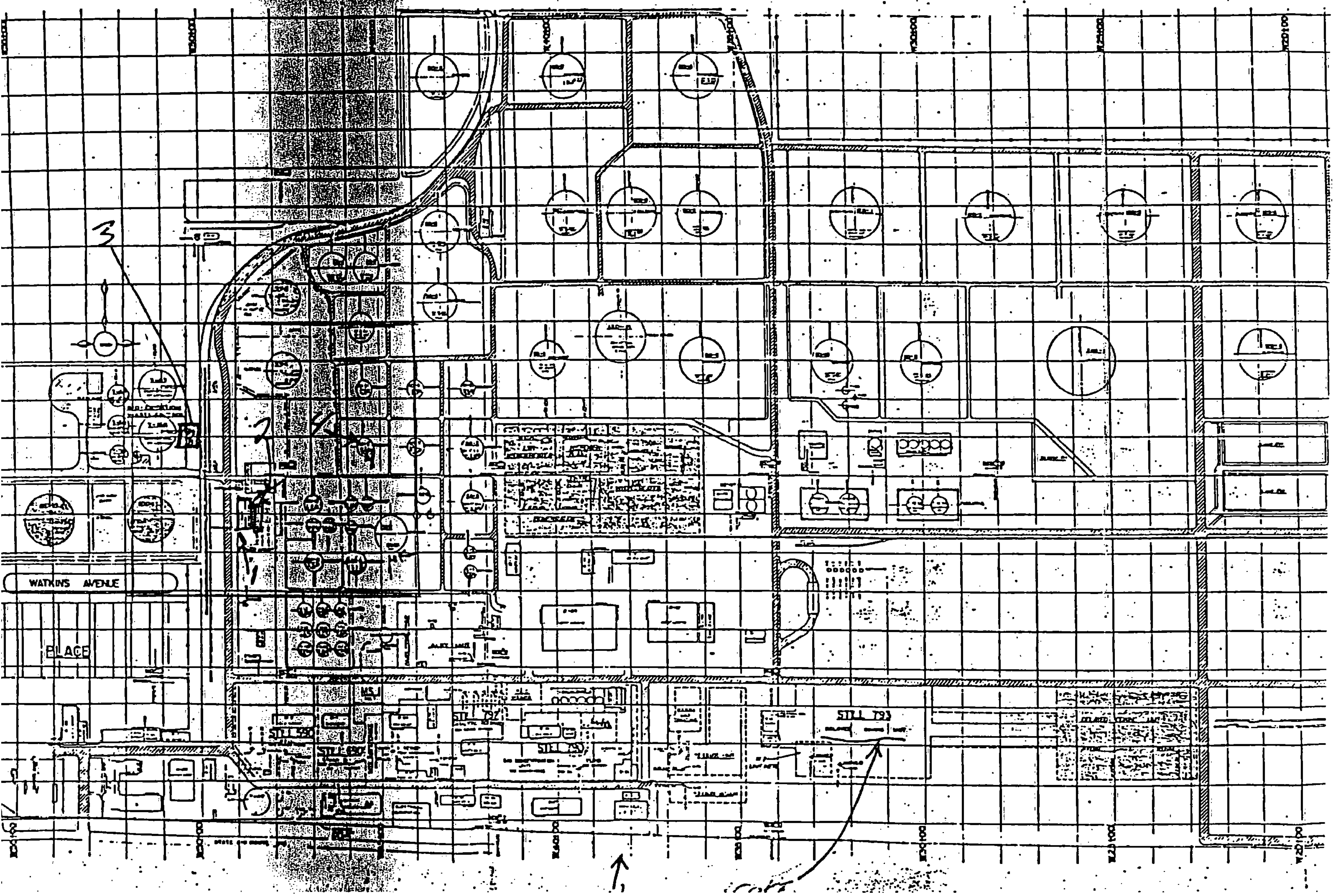
The facility's paperwork was reviewed and no deficiencies were observed in conjunction with the Part 722 requirements. The deficiencies observed are related to Tank 10-2 and the regulations set forth in Subpart J of Section 725, pursuant to 722.134(a)(1). Per Mr. Thomas, the tank is approximately 50 years old. Containment is provided, however it consists only of earthen berms. Secondary containment meeting the requirements set forth in Section 725.293 has not been provided for Tank 10-2. Secondary Containment was required for this tank by January 12, 1989 pursuant to Section 725.293(a)(4). Not only is the required secondary containment not provided, but significant visual contamination was observed within the earthen berm of Tank 10-2. Where tank systems have had leaks or spills, the facility should immediately discontinue use of the tank system and implement the requirements of Section 725.296. It appears the spillage observed is years of accumulation of waste drippage and spillage. Also the tank is not labelled with the words "hazardous waste" as required by 722.134(a)(3). As a result, apparent violations of Section 722.134(a)(1&3) were observed.

The specific requirements of 722.134(a)(1) being alleged are 725.293 and 725.296.

MDG:jlr/0309L


Photos
N
55-5
55-4
100-1
LSR
HYDROTREATER
HYDROGEN
PLANT
CONTROL
ROOM
VGO
HYDROTREATER
ISOMERIZATION
ALKY UNIT
MS 1
POLY
STILL 590
STILL 792
CATALYTIC REFORMER
STILL 790

1- API Seperator
2- DAF UNIT
3- DRUM STORAGE PAD
4- TANK 10-2



Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

217/782-6762

Refer to: 1190500002 - Madison County
Hartford/Clark Oil and Refining
ILD041889023
Compliance File

September 27, 1989

Clark Oil and Refining
Attn: Richard Thomas, Environmental Engineer
Post Office Box 7
Hartford, Illinois 62048

Dear Mr. Thomas:

On September 14, 1989 your facility was inspected by Mike Grant of the Illinois Environmental Protection Agency. The purpose of this follow-up inspection was to determine your facility's compliance status with respect to the apparent violations cited in the February 21, 1989 Compliance Inquiry Letter. During the inspection it was determined that the apparent violations of Section(s) 722.134(a) were satisfactorily resolved.

If you have any questions, please contact Mike Grant at 618/346-5120.

Sincerely,

Angela Aye Tin

Angela Aye Tin, Manager
Technical Compliance Unit
Compliance Section
Division of Land Pollution Control

AAT:MG:CLN:sap/3320k,71

cc: Division File
Collinsville Region
Bruce Carlson
Chris Nifong

# INSPECTION REPORT

PA Number: ILD041889023 IEPA Number: 1191150002

ility Name: Clark Oil and Refining

eet: Hawthorne Street P.O. Box 7

y: Hartford Telephone: 618/254-7301

nty: Madison State: Ill Zip Code: 62048

e of Facility: Notified As: Gen Regulated As: Gen

? yes __ no X HPV? yes __ no X 90 Day Follow-up Required? yes __ no (

ion: 6 Date of Inspection: 9/14/89 6/15/89 From: 9:50 1:30 to 10:50 2:45

ther (LDF Only): ____

e of Inspection

: __ Sampling: __ Citizen Complaint: __ Closed: __ Withdrawal: __

ord Review: __ Follow-up to Inspection of 2/2/89: X Other: __

Regulated Status

ll Quant. Gen:: __ Claimed Nonhandler: __ Other(Specify in narrative): __

fication date, ______, from initial __ or subsequent __ notification.

A date, ______, from initial __ or amended __ Part A.

B permit application submitted? yes __ no __

the firm been referred to: USEPA? yes __ no __; IAG? yes __ no __; Count

es Attorney? yes __ no __. Date of referral to USEPA: ______,

______, County States Attorney: ______.

ral Court Order Issued: ______ State Court Order Issued: ______

A Compliance Order Issued: ______ Illinois PCB Order Issued: ______

cility Activity Summary

| cy(by s Code) | On Pt A | Activity Conducted Prior to 1980 | Was Activity Ever Done | Closed | Being Done at Time of Inspection | Exempt From Regulation per 35 IAC, Section: | On Annual Report For 8_ | 8_ | 8_ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

RECEIVED

SEP 21 1989

IEPA-DLPC

ator: SAME AS LOCATION Telephone #:

eet:

: State: Zip Code:

er: SAME AS LOCATION Telephone #:

eet:

: State: Zip Code:

| son Interviewed | Title | Telephone # |
|---|---|---|
| Richard Thomas | Env. Engineer | 618/254-7301 |
| | | |
| | | |
| | | |
| | | |

| ection Participants | Agency/Title | Telephone # |
|---|---|---|
| Mike Grant | IEPA/EPS | 618/346-5120 |
| | | |
| | | |
| | | |
| | | |

| ared By | Agency/Title | Telephone # |
|---|---|---|
| Michael D. Grant | IEPA/EPS | 618/346-5120 |

Summary of Apparent Violations

| ea | Class | Section | Area | Class | Section | Area | Class | Section |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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1191150002
Madison County
Clark Oil & Refining
ILD041889023

REMARKS

Follow-up inspections were conducted at the subject facility on June 15, 1989 and September 14, 1989. The purpose of the June 15, 1989 inspection was to observe the closure activities occurring on Tank 10-2. The purpose of the September 14, 1989 inspection was to ensure all the closure activities had been completed. It was determined by Clark that closure of Tank 10-2 was required in order for them to comply with the apparent violations of Section 722.134(a)(1) identified during the February 2, 1989 ISS inspection. Specifically, apparent violations of Section 725.293(a)(4) - Secondary containment for Tank 10-2 had not been provided by January 12, 1989 and Section 725.296 - Visual contamination was observed within the earthen berm of Tank 10-2. It was determined by Clark to remove and close Tank 10-2 and install a recovery system at the Coking Unit.

During the June 15, 1989 inspection, Tracker, subcontractor for Chemical Waste Management (CWM), was operating a filter press adjacent to Tank 10-2. The tank had been removed down to several feet above the waste level. Approximately 300 tons of waste/contaminated soil had been excavated within the tank farm and was shipped to CWM's landfill in Emelle, Alabama. Also, the foundation for the recovery system at the Coker Unit had been poured. Tracker started fixating the waste on June 12, 1989. A progress report received from Clark on July 20, 1989 (attached) indicated that it was decided by CWM that this operation was not being effective and Tracker was removed from the job. The remaining sludge was solidified by CWM and shipped to the Emelle facility. A total of 297 tons was shipped from the tank clean-out and 409 tons of waste/soil from within the earthen berm. The remaining soil within the berm was then treated with microbes. Two applications of microbes were used.

During the September 14, 1989 inspection, the former tank storage area was observed. Also observed was the new recycling system. The new system has yet to be completed. All API oil was being accumulated in Tank 4, which is part of the facility's NPDES permitted wastewater treatment plant. One load of API sludge was shipped to Heritage Environmental Service on May 19, 1989 and the oil has been trucked for use in the Coking Unit.

As a result of these follow-up inspections, the apparent violations of Section 722.134(a)(1) are considered resolved.

MDG:cas/0404L
Attachment

7/18/89: Second treatment of soil, this time with microbes followed by fertilizer within a few days.

8/89: Second dosage of fertilizer is applied to area.

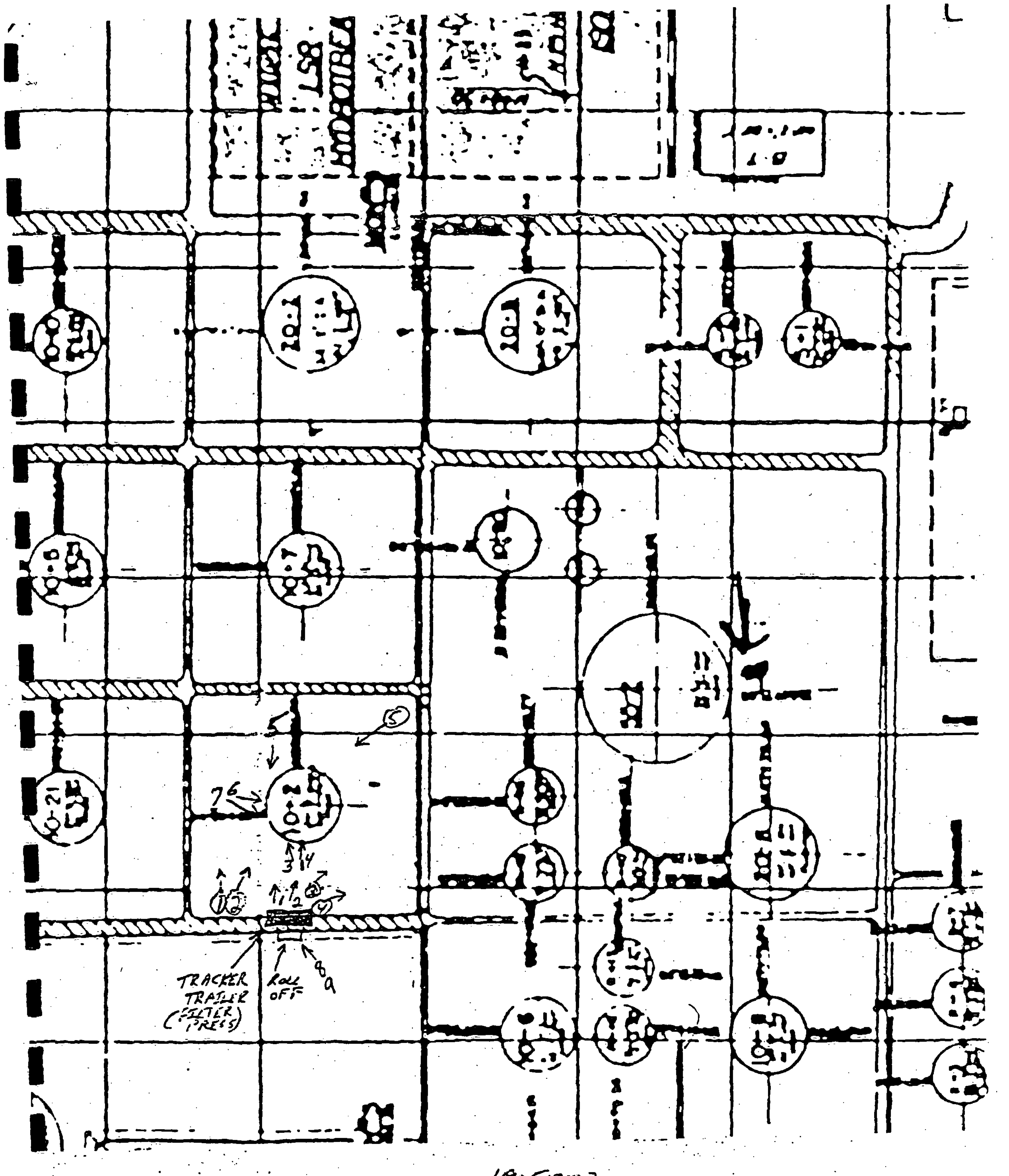
9/89: Treatment of tank farm area completed.

If you have any questions about this schedule or any part of the cleanup, please call me at (618) 254-7301.

Sincerely,

Richard Thomas

Richard Thomas




1190500002
CLARK OIL + REFINING
PHOTOS
ROLL 1088 (6/05/89)
ROLL 1140 (9/14/89)

**CLARK OIL & REFINING CORPORATION**

Wood River Refinery
P.O. Box 7
Hartford, Illinois 62048
(618) 254-7301

July 18, 1989



Mr. Mike Grant
Illinois Environmental Protection Agency
2009 Mall Street
Collinsville, IL 62234

Dear Mr. Grant:

In response to our recent telephone conversation, the following is an outline of dates and progress in the cleanup and removal of tank 10-2. Not included in this outline are the numerous attempts by Clark Oil in March thru June 1989 to obtain a commitment from Chemical Waste Management (CWM) and to demand action from CWM.

6/2/89: CWM begins setting up equipment, making connections to water and electric, and ordering additional equipment.

6/5/89: CWM begins by attempting to cut the roof off the tank. Unable to do this, they remove the sides of the tank leaving several feet of headboard above the waste. The roof is in this way removed in small pieces.

6/9 - 6/12/89: Tracker begins setting up equipment and ordering replacements for the equipment broken. CWM finishes removing sides of tank.

6/14/89: Tracker starts processing the residual tank bottoms.

6/23/89: After nine days of work, Tracker has never processed more than two cycles per day and is beginning to process less than one cycle per day. CWM decides to remove Tracker from the job.

6/27/89: Tracker has removed most of their equipment, and CWM begins solidifying and removing tank bottoms.

6/30/89: CWM finishes cleaning tank.

7/3 - 7/6/89: CWM cuts up and removes bottom of tank. The area around the tank is again cleaned, and contaminants are removed.

7/10/89: Initial treatment of soil with microbes begins.

# APPENDIX P-3

## AREA E TANK 120-2 SPILL AREA
## IEMA INCIDENT 930211

State of Illinois
# ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/782/3637

September 22, 1995

CERTIFIED MAIL
Return Receipt Requested
Z 422 918 936

Mr. Russell Eggert
Mayer, Brown, & Platt
190 S. LaSalle
Chicago, IL 60603

PRE-ENFORCEMENT CONFERENCE LETTER

Re: Nine Release Incidents at Clark's Hartford, Illinois Refinery and Dock
Dates of Releases: February 1993 - June 1995

Dear Mr. Eggert:

Review of available information and personal investigation by representatives of the Illinois Environmental Protection Agency ("Agency") indicate that the Hartford, Illinois refinery and dock owned and operated by Clark Oil and Refining Corporation is in apparent noncompliance with the Illinois Environmental Protection Act, 415/LCS 5/1, et seq. ("Act"), as the result of nine environmental release incidents which occurred from February 1993 through June 1995. These releases are in addition to the thirteen incidents previously cited in my October 21, 1994 pre-enforcement letter to Clark and this letter supplements that prior letter. The incident numbers and occurrence dates associated with the nine releases are as follows: 930211 (2/21/93); 942288 (10/10/94); 942432 (10/28/94); 942554 (11/14/94); 942837 (12/16/94); 942855 (12/20/94); 950726 (4/11/95); and 950893 (5/1/95). Attachment one (1) to this letter provides specific details of the identity of the material released, the quantity of material released, the environmental medium impacted, and the cause reported by Clark for each incident.

The materials released at the Hartford refinery and dock have included the following: crude oil, gasoline, fuel oil, hydrogen, gasoil, diesel and petroleum (NOS). The total quantity of these various materials exceeded 47,821 gallons, based upon Clark's reports to the Illinois Emergency Management Agency ("IEMA") and/or IEPA. These releases have impacted soil, groundwater, surface water and air, and continue to present continuing sources of contamination.

Releases 950726 and 950893, have been observed/confirmed to have contaminated surface waters, while the residual contamination from 930211, 942288, 942432, 942837, 942855 and 951217 may be continuing to threaten releases to waters of the State (both surface water and groundwater). Such releases of contaminants to waters of the State constitute violations of Sections 12(a)(d) and (f) of the Act. Furthermore, releases 950726 and 950893 also violated 35 Ill.Adm. Code 302.203 since they resulted in the presence of visible oil on the Mississippi River. All of the releases except 942554 impacted soil and land surface, and may constitute open dumping under Section 21 of the Act. Release 942554 involved the release of hydrogen gas to the air, resulting in a fire, and constituted a violation of Section 9 of the Act, which prohibits releases of contaminants to the air. The text of these sections appears in Attachment two(2).

Further review of the releases previously cited in my October 21, 1994 letter has also identified additional violations. Releases 4DBB (5/23/94), 4DBC (5/31/94), 941478 (7/2/94) and 941701 (8/1/94) caused the presence of visible oil in the Mississippi River in violation of 35 Ill.Adm. Code 302.203. Release 940851 (3/1/94) also violated section 12(f) of the Act because Clark did not have an NPDES permit authorizing such a discharge. The text of these sections appears in Attachment two (2).

Resolution of this apparent non-compliance through prompt, voluntary action by Clark Oil and Refining Corporation is the preferred course of action. However, the Agency has a statutory responsibility to pursue formal enforcement proceedings to obtain penalties and injunctive relief against environmental releases which constitute violations of the Act if voluntary compliance is not obtained in a timely fashion. Non-compliance with the cited requirements of the Act may subject Clark Oil and Refining Corporation to civil penalties of up to $50,000 for each violation, plus up to $10,000 for every succeeding day each violation continues.

If Clark Oil and Refining Corporation does not, by the close of business on October 12, 1995, provide the Agency with a written commitment and timetable for the performance of all investigation and remediation made necessary by the above-referenced nine releases, the Agency's Division of Legal Counsel may refer this matter to the Attorney General's Office for formal enforcement. The remedy to be required by the Agency will likely require the implementation of new measures to prevent future releases, detect them more readily, and to respond more effectively in the event of release contingencies.

By means of this pre-enforcement conference letter, the Agency is offering you an opportunity to meet with Agency representatives pursuant to Section 31(d) of the Act prior to the initiation of formal enforcement. Pursuant to your discussion with Assistant Attorney General, Jim Morgan, appropriate Agency representatives will be available to participate in a 31(d) meeting relative to the violations cited herein at 9:30 a.m. on October 12, 1995 in Collinsville, Illinois. It is my understanding that Clark has agreed to arrange for a room for the meeting at the Collinsville Holiday Inn. When you have finalized the meeting room arrangements, please contact Ms. Nicole Piller, Division of Legal Counsel, at (217) 782-5544 with the information.

Sincerely,

James P. O'Brien

James Patrick O'Brien
Manager,
Office of Chemical Safety

Attachment

cc: Jim Morgan, IAGO

# ATTACHMENT 1
## Clark Oil
## Hartford Refinery & Dock
## Additional Releases to Soil, Ground Water, Surface Water or Air, February 1993-June 1995

| Incident # | Date | Quantity | Material | Medium Impacted | Cause |
|---|---|---|---|---|---|
| 930211 | 2/21/93 | 750 bbls. | Crude Oil | Soil; possible groundwater | Release from above ground tank due to failed rupture disk |
| 942288 | 10/10/94 | 25 bbls. | Gasoline | Soil; possible groundwater | Pipeline sprung leak |
| 942432 | 10/28/94 | more than 25 gal | Fuel Oil | Soil | Transfer line rupture |
| 942554 | 11/14/94 | Unknown | Hydrogen | Air | Leak in flange in processing unit, which resulted in fire |
| 942837 | 12/16/94 | 10-30 bbls. | Gas oil | Soil; possible groundwater | Overfill of above ground tank |
| 942855 | 12/20/94 | 42 gal | Crude oil | Soil; possible groundwater | Leak in pipeline |
| 950726 | 4/11/95 | 2 bbl | Diesel | Soil; Mississippi River | Pipeline rupture at loading dock |
| 950893 | 5/1/95 | Unknown | Petroleum (NOS) | Soil; Mississippi River; probable groundwater | Unexplained release from soil in dock area (historic contamination) |
| 951217 | 6/7/95 | 350 bbls | Crude Oil | Soil; possible groundwater | Valve to above ground tank left unattended |



6

ATTACHMENT 2

Section 9. No person shall: (a) Cause or threaten or allow the discharge or emission of any contaminant into the environment in any State so as to cause or tend to cause air pollution in Illinois, either alone or in combination with contaminants from other sources, or so as to violate regulations or standards adopted by the Board under this Act; (b) Construct, install, or operate any equipment, facility, vehicle, vessel, or aircraft capable of causing or contributing to air pollution or designed to prevent air pollution, of any type designated by Board regulations, without a permit granted by the Agency, or in violation of any conditions imposed by such permit; (c) Cause or allow the open burning of refuse, conduct any salvage operation by open burning, or cause or allow the burning of any refuse in any chamber not specifically designed for the purpose and approved by the Agency pursuant to regulations adopted by the Board under this Act; except that the Board may adopt regulations permitting open burning of refuse in certain cases upon a finding that no harm will result from such burning, or that any alternative method of disposing of such refuse would create a safety hazard so extreme as to justify the pollution that would result from such burning; (d) Sell, offer, or use any fuel or other article in any areas in which the Board may by regulation forbid its sale, offer, or use for reasons of air-pollution control; (e) Use, cause or allow the spraying of loose asbestos for the purpose of fireproofing or insulating any building or building material or other constructions, or otherwise use asbestos in such unconfined manner as to permit asbestos fibers or particles to pollute the air; (f) Commencing July 1, 1985, sell any used oil for burning or incineration in any incinerator, boiler, furnace, burner or other equipment unless such oil meets standards based on virgin fuel oil or re-refined oil, as defined in ASTM D-396 or specifications under VV-F-815C promulgated pursuant to the federal Energy Policy and Conservation Act, and meets the manufacturer's and current NFDA code standards for which such incinerator, boiler, furnace, burner or other equipment was approved, except that this prohibition does not apply to a sale to a permitted used oil re-refining or reprocessing facility or sale to a facility permitted by the Agency to burn or incinerate such oil. Nothing herein shall limit the effect of any section of this Title with respect to any form of asbestos, or the spraying of any form of asbestos, or limit the power of the Board under this Title to adopt additional and further regulations with respect to any form of asbestos, or the spraying of any form of asbestos. This Section shall not limit the burning of landscape waste upon the premises where it is produced or at sites provided and supervised by any unit of local government, except within any county having a population of more than 400,000. (Source: P.A. 84-705.)

Section 12. No person shall: (a) Cause or threaten or allow the discharge of any contaminants into the environment in any State so as to cause or tend to cause water pollution in Illinois, either alone or in combination with matter from other sources, or so as to violate regulations or standards adopted by the Pollution Control Board under this Act. (b) Construct, install, or operate any equipment, facility, vessel, or aircraft capable of causing or contributing to water pollution, or designed to prevent water pollution, of any type designated by Board regulations, without a permit granted by the Agency, or in violation of any conditions imposed by such permit. (c) Increase the quantity or strength of any discharge of contaminants into the waters, or construct or install any sewer or sewage treatment facility or any new outlet for contaminants into the waters of this State, without a permit granted by the Agency. (d) Deposit any contaminants upon the land in such place and manner so as to create a water pollution hazard. (e) Sell, offer, or use any article in any area in which the Board has by regulation forbidden its sale, offer, or use for reasons of water pollution control. (f) Cause, threaten or allow the discharge of any contaminant into the waters of the State, as defined herein, including but not limited to, waters to any sewage works, or into any well or from any point source within the State, without an NPDES permit for point source discharges issued by the Agency under Section 39(b) of this Act, or in violation of any term or condition imposed by such permit, or in violation of any NPDES permit filing requirement established under Section 39(b), or in violation of any regulations adopted by the Board or of any order adopted by the Board with respect to the NPDES program. No permit shall be required under this subsection and under Section 39(b) of this Act for any discharge for which a permit is not required under the Federal Water Pollution Control Act, as now or hereafter amended, and regulations pursuant thereto. For all purposes of this Act, a permit issued by the Administrator of the United States Environmental Protection Agency under Section 402 of the Federal Water Pollution Control Act, as now or hereafter amended, shall be deemed to be a permit issued by the Agency pursuant to Section 39(b) of this Act. However, this shall not apply to the exclusion from the requirement of an operating permit provided under Section 13(b) (i). Compliance with the terms and conditions of any permit issued under Section 39(b) of this Act shall be deemed compliance with this subsection except that it shall not be deemed compliance with any standard or effluent limitation imposed for a toxic pollutant injurious to human health. In any case where a permit has been timely applied for pursuant to Section 39(b) of this Act but final administrative disposition of such application has not been made, it shall not be a violation of this subsection to discharge without such permit unless the complainant proves that final administrative disposition has not been made because of the failure of the applicant to furnish information reasonably required or requested in order to process the application. For purposes of this provision, until implementing requirements have been established by the Board and the Agency, all applications deemed filed with the Administrator of the United States Environmental Protection Agency pursuant to the provisions of the Federal Water Pollution Control Act, as now or hereafter amended, shall be deemed filed with the Agency. (g) Cause, threaten or allow the underground injection of contaminants without a UIC permit issued by the Agency under Section 39(d) of this Act, or in violation of any term or condition imposed by such permit, or in violation of any regulations or standards adopted by the Board or of any order adopted by the Board with respect to the UIC program. No permit shall be required under this subsection and under Section 39(d) of this Act for any underground injection of contaminants for which a permit is not required under Part C of the Safe Drinking Water Act (P.L. 93-523), as amended, unless a permit is authorized or required under regulations adopted by the Board pursuant to Section 13 of this Act. (h) Introduce contaminants into a sewage works from any nondomestic source except in compliance with the regulations and standards adopted by the Board under this Act. (Source: P.A. 86-671.)

Section 21. No person shall: (a) Cause or allow the open dumping of any waste. (b) Abandon, dump, or deposit any waste upon the public highways or other public property, except in a sanitary landfill approved by the Agency pursuant to regulations adopted by the Board. (c) Abandon any vehicle in violation of the "Abandoned Vehicles Amendment to the Illinois Vehicle Code", as enacted by the 76th General Assembly. (d) Conduct any waste-storage, waste-treatment, or waste-disposal operation: (1) without a permit granted by the Agency or in violation of any conditions imposed by such permit, including periodic reports and full access to adequate records and the inspection of facilities, as may be necessary to assure compliance with this Act and with regulations and standards adopted thereunder; provided, however, that no permit shall be required for (i) any person conducting a waste-storage, waste-treatment, or waste-disposal operation for wastes generated by such person's own activities which are stored, treated, or disposed within the site where such wastes are generated, or (ii) for a corporation organized under the General Not For Profit Corporation Act of 1986, as now or hereafter amended, or a predecessor Act, constructing a land form in conformance with local zoning provisions, within a municipality having a population of more than 1,000,000 inhabitants, with clean construction or demolition debris generated within the municipality, provided that the corporation has contracts for economic development planning with the municipality; or (2) in violation of any regulations or standards adopted by the Board under this Act; or (3) which receives waste after August 31, 1988, does not have a permit issued by the Agency, and is (i) a landfill used exclusively for the disposal of waste generated at the site, (ii) a surface impoundment receiving special waste not listed in an NPDES permit, (iii) a waste pile in which the total volume of waste is greater than 100 cubic yards or the waste is stored for over one year, or (iv) a land treatment facility receiving special waste generated at the site; without giving notice of the operation to the Agency by January 1, 1989, or 30 days after the date on which the operation commences, whichever is later, and every 3 years thereafter. The form for such notification shall be specified by the Agency, and shall be limited to information regarding: the name and address of the location of the operation; the type of operation; the types and amounts of waste stored, treated or disposed of on an annual basis; the remaining capacity of the operation; and the remaining expected life of the operation. Paragraph (3) of this subsection (d) shall not apply to any person engaged in agricultural activity who is disposing of a substance that constitutes solid waste, if the substance was acquired for use by that person on his own property, and the substance is disposed of on his own property in accordance with regulations or standards adopted by the Board. This subsection (d) shall not apply to hazardous waste. (e) Dispose, treat, store or abandon any waste, or transport any waste into this State for disposal, treatment, storage or abandonment, except at a site or facility which meets the requirements of this Act and of regulations and standards thereunder. (f) Conduct any hazardous waste-storage, hazardous waste-treatment or hazardous waste-disposal operation: (1) without a RCRA permit for the site issued by the Agency under subsection (d) of Section 39 of this Act, or in violation of any condition imposed by such permit, including periodic reports and full access to adequate records and the inspection of facilities, as may be necessary to assure compliance with this Act and with regulations and standards adopted thereunder; or (2) in violation of any regulations or standards adopted by the Board under this Act; or (3) in violation of any RCRA permit filing requirement established under standards adopted by the Board under this Act; or (4) in violation of any order adopted by the Board under this Act. Notwithstanding the above, no RCRA permit shall be required under this subsection or subsection (d) of Section 39 of this Act for any person engaged in agricultural activity who is disposing of a substance which has been identified as a hazardous waste, and which has been designated by Board regulations as being subject to this exception, if the substance was acquired for use by that person on his own property and the substance is disposed of on his own property in accordance with regulations or standards adopted by the Board. (g) Conduct any hazardous waste-transportation operation: (1) without a permit issued by the Agency or in violation of any conditions imposed by such permit, including periodic reports and full access to adequate records and the inspection of facilities, as may be necessary to assure compliance with this Act and with regulations or standards adopted thereunder; or (2) in violation of any regulations or standards adopted by the Board under this Act. (h) Conduct any hazardous waste-recycling or hazardous waste-reclamation or hazardous waste-reuse operation in violation of any regulations, standards or permit requirements adopted by the Board under this Act. (i) Conduct any process or engage in any act which produces hazardous waste in violation of any regulations or standards adopted by the Board under subsections (a) and (c) of Section 22.4 of this Act. (j) Conduct any special waste transportation operation in violation of any regulations, standards or permit requirements adopted by the Board under this Act. However, sludge from a water or sewage treatment plant owned and operated by a unit of local government which (1) is subject to a sludge management plan approved by the Agency or a permit granted by the Agency, and (2) has been tested and determined not to be a hazardous waste as required by applicable State and federal laws and regulations, may be transported in this State without a special waste hauling permit, and the preparation and carrying of a manifest shall not be required for such sludge under the rules of the Pollution Control Board. The unit of local government which operates the treatment plant producing such sludge shall file a semiannual report with the Agency identifying the volume of such sludge transported during the reporting period, the hauler of the sludge, and the disposal sites to which it was transported. This subsection (j) shall not apply to hazardous waste. (k) Fail or refuse to pay any fee imposed under this Act. (l) Locate a hazardous waste disposal site above an active or inactive shaft or tunneled mine or within 2 miles of an active fault in the earth's crust. In counties of population less than 225,000 no hazardous waste disposal site shall be located (1) within 1 1/2 miles of the corporate limits as defined on June 30, 1978, of any municipality without the approval of the governing body of the municipality in an official action; or (2) within 1000 feet of an existing private well or the existing source of a public water supply measured from the boundary of the actual active permitted site and excluding existing private wells on the property of the permit applicant. The provisions of this subsection do not apply to publicly-owned sewage works or the disposal or utilization of sludge from publicly-owned sewage works. (m) Transfer interest in any land which has been used as a hazardous waste disposal site without written notification to the Agency of the transfer and to the transferee of the conditions imposed by the Agency upon its use under subsection (g) of Section 39. (n) Use any land which has been used as a hazardous waste disposal site except in compliance with conditions imposed by the Agency under subsection (g) of Section 39. (o) Conduct a sanitary landfill operation which is required to have a permit under subsection (d) of this Section, in a manner which results in any of the following conditions: (1) refuse in standing or flowing waters; (2) leachate flows entering waters of the State; (3) leachate flows exiting the landfill confines (as determined by the boundaries established for the landfill by a permit issued by the Agency); (4) open burning of refuse in violation of Section 9 of this Act; (5) uncovered refuse remaining from any previous operating day or at the conclusion of any operating day, unless authorized by permit; (6) failure to provide final cover within time limits established by Board regulations; (7) acceptance of wastes without necessary permits; (8) scavenging as defined by Board regulations; (9) deposition of refuse in any unpermitted portion of the landfill; (10) acceptance of a special waste without a required manifest; (11) failure to submit reports required by permits or Board regulations; (12) failure to collect and contain litter from the site by the end of each operating day. The prohibitions specified in this subsection (o) shall be enforceable by the Agency either by administrative citation under Section 31.1 of this Act or as otherwise provided by this Act. The specific prohibitions in this subsection do not limit the power of the Board to establish regulations or standards applicable to sanitary landfills. (p) In violation of subdivision (a) of this Section, cause or allow the open dumping of any



11

prohibitions in this subsection do not limit the power of the Board to establish regulations or standards applicable to open dumping. (q) Conduct a landscape waste composting operation without an Agency permit, provided, however, that no permit shall be required for any person: (1) conducting a landscape waste composting operation for landscape wastes generated by such person's own activities which are stored, treated or disposed of within the site where such wastes are generated; or (2) applying landscape waste or composted landscape waste at agronomic rates; or (3) operating a landscape waste composting facility on a farm, if the facility meets all of the following criteria: (A) the composting facility is operated by the farmer on property on which the composting material is utilized, and the composting facility constitutes no more than 2% of the property's total acreage, except that the Agency may allow a higher percentage for individual sites where the owner or operator has demonstrated to the Agency that the site's soil characteristics or crop needs require a higher rate; (B) the property on which the composting facility is located, and any associated property on which the compost is used, is principally and diligently devoted to the production of agricultural crops and is not owned, leased or otherwise controlled by any waste hauler or generator of nonagricultural compost materials, and the operator of the composting facility is not an employee, partner, shareholder, or in any way connected with or controlled by any such waste hauler or generator; (C) all compost generated by the composting facility is applied at agronomic rates and used as mulch, fertilizer or soil conditioner on land actually farmed by the person operating the composting facility, and the finished compost is not stored at the composting site for a period longer than 18 months prior to its application as mulch, fertilizer, or soil conditioner; (D) the owner or operator, by January 1, 1990 (or the January 1 following commencement of operation, whichever is later) and January 1 of each year thereafter, (i) registers the site with the Agency, (ii) reports to the Agency on the volume of composting material received and used at the site, (iii) certifies to the Agency that the site complies with the requirements set forth in subparagraphs (A), (B) and (C) of this paragraph (q)(3), and (iv) certifies to the Agency that all composting material was placed more than 200 feet from the nearest potable water supply well, was placed outside the boundary of the 10-year floodplain or on a part of the site that is floodproofed, was placed at least 1/4 mile from the nearest residence (other than a residence located on the same property as the facility) and there are not more than 10 occupied non-farm residences within 1/2 mile of the boundaries of the site on the date of application, and was placed more than 5 feet above the water table. For the purposes of this subsection (q), "agronomic rates" means the application of not more than 20 tons per acre per year, except that the Agency may allow a higher rate for individual sites where the owner or operator has demonstrated to the Agency that the site's soil characteristics or crop needs require a higher rate. (r) Cause or allow the storage or disposal of coal combustion waste unless: (1) such waste is stored or disposed of at a site or facility for which a permit has been obtained or is not otherwise required under subsection (d) of this Section; or (2) such waste is



12

stored or disposed of as a part of the design and reclamation of a site or facility which is an abandoned mine site in accordance with the Abandoned Mined Lands and Water Reclamation Act; or (3) such waste is stored or disposed of at a site or facility which is operating under NPDES and Subtitle D permits issued by the Agency pursuant to regulations adopted by the Board for mine-related water pollution and permits issued pursuant to the Federal Surface Mining Control and Reclamation Act of 1977 (P.L. 95-87) or the rules and regulations thereunder or any law or rule or regulation adopted by the State of Illinois pursuant thereto, and the owner or operator of the facility agrees to accept the waste; and either (i) such waste is stored or disposed of in accordance with requirements applicable to refuse disposal under regulations adopted by the Board for mine-related water pollution and pursuant to NPDES and Subtitle D permits issued by the Agency under such regulations; or (ii) the owner or operator of the facility demonstrates all of the following to the Agency, and the facility is operated in accordance with the demonstration as approved by the Agency: (1) the disposal area will be covered in a manner that will support continuous vegetation, (2) the facility will be adequately protected from wind and water erosion, (3) the pH will be maintained so as to prevent excessive leaching of metal ions, and (4) adequate containment or other measures will be provided to protect surface water and groundwater from contamination at levels prohibited by this Act, the Illinois Groundwater Protection Act, or regulations adopted pursuant thereto. Notwithstanding any other provision of this Title, the disposal of coal combustion waste pursuant to item (2) or (3) of this subdivision (r) shall be exempt from the other provisions of this Title V, and notwithstanding the provisions of Title X of this Act, the Agency is authorized to grant experimental permits which include provision for the disposal of wastes from the combustion of coal and other materials pursuant to items (2) and (3) of this subdivision (r). (s) After April 1, 1989, offer for transportation, transport, deliver, receive or accept special waste for which a manifest is required, unless the manifest indicates that the fee required under Section 22.8 of this Act has been paid. (Source: P.A. 86-364; 86-633; 86-671; 86-820; 86-1028; 86-1185; 87-608; 87-752; 87-895.)

Title 35
Environmental Protection
Subtitle C: Water Pollution
Chapter I: Pollution Control Board

**Section 302.203 Offensive Conditions**

Waters of the State shall be free from sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin. The allowed mixing provisions ofSection 302.102 shall not be used to comply with the provisions of this Secilon.

(Source: Amended at 14 Ill. Reg. 2899, effective February 13, 1990)

# Office of the Attorney General

State of Illinois

March 11, 1996

Jim Ryan
ATTORNEY GENERAL

Pat Sharkey
Mayer, Brown and Platt
190 South LaSalle Street
Chicago, IL 60603-3441

RE: Clark Hartford / Spill Sampling Plan Revision Approvals

Dear Ms. Sharkey:

I am writing to confirm the Agency's acceptance of the plan for sampling that was discussed at a meeting held on February 27, 1996 between representatives of the State and Clark. Initially, Burns & McDonnell had prepared a Sampling and Analysis Plan for Areas B, C, D, F, H, and J. In my letter dated January 16, 1996, to you we proposed additional sampling in Areas A, E, and G as well as groundwater sampling in Areas K and L. At the February 27, 1996, meeting, representatives of Clark presented the State with a two page table of proposals for sampling at the various areas in response to the issues raised in my letter. Further discussions at that meeting resulted in an apparent agreement regarding a sampling plan acceptable to all parties. Following are the specifics of that plan as it is understood by the Illinois EPA representatives.

| | |
|---|---|
| Area A -- representing spill #940851<br><br>Asphalt spill<br><br>Northwest of Bio Unit | Surface samples (one foot below post-cleanup fill interface)<br><br><u>VOC: 4 samples for BTEX</u><br><br><u>PNAs: 3 samples for analysis:</u> One from S-1, a composite of S-2 and S-3, and one from S-4. S-1 and S-4 are intended to be collected just outside the previously remediated area to the south and north respectively. |

500 South Second Street, Springfield, Illinois 62706 (217) 782-1090 • TTY: (217) 785-2771 • FAX: (217) 782-7046
100 West Randolph Street, Chicago, Illinois 60601 (312) 814-3000 • TTY: (312) 814-3374 • FAX: (312) 814-3806
1001 East Main, Carbondale, Illinois 62901 (618) 457-3505 • TTY: (618) 457-4421 • FAX: (618) 457-3509

| | |
|---|---|
| **Area B – representing spill #941772**<br>Gasoline spill from mixer failure at Tank 35-2<br>**Tank Area 35-1 & -2** | **Surface samples** (6" to 12" depth)<br>VOC: 7 samples for BTEX (SB-1 thru SB-5 as proposed, and two more north and south of SB-3 in line with SB-2, SB-5 and SB-1, SB-4 respectively)<br>**Subsurface samples** (two samples each, collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br>VOC: 5 borings each for BTEX (at proposed SB-1 thru SB-5) |
| **Area B – representing spill #941772**<br>Gasoline spill from mixer failure at Tank 35-2 5<br>**Tank Area 35-3** | **Surface samples** (6" to 12" depth)<br>VOC: 7 samples for BTEX (5 samples in area affected in east ½ of Tank Area and 2 samples from that part not apparently impacted within the tank dike area)<br>**Subsurface samples** (two samples each, collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br>VOC: 2 borings for BTEX (both in area affected in East ½ of Tank Area) |
| **Area B – representing spill #941772**<br>Gasoline spill from mixer failure at Tank 35-2<br>**Tank Area 55-1** | Consolidated with requirements for Area C, since same tank farm affected. |
| **Area C – representing spills #942837 and #941772**<br>Gasoil overfill of Tank 55-1 and overflow of gasoline spill from drainage from Tank Area mixer failure at Tank 35-2<br>**Tank Area 55-1** | **Surface samples** (6" to 12" depth)<br>VOC: 7 samples for BTEX (4 at SB-1 thru SB-4 and three others: one located between SB-3 and SB-4, one collected between the pipe rack and tank 55-1 adjacent to the easternmost aspect of that tank, and one collected between SB-1 and SB-2)<br>PNAs: 4 composite samples, each of 5 discrete sampling points, as indicated in proposal diagram.<br>**Subsurface samples** (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br>BTEX and PNAs: 4 borings (at SB-1 thru SB-4 as indicated in the proposal diagram) |

| | |
|---|---|
| **Area D – representing spill #941526**<br><br>Naphtha and toluene<br><br>Tank Area 10-5 | **Surface samples (6" to 12" depth)**<br><br>VOC: 4 samples for BTEX and Naphthalene (2 at five to ten feet on either side [east & west] of SB-3 and 2 more collected between east-center of tank and dike wall)<br><br>**Subsurface samples** ( two samples collected from each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 4 borings for BTEX and Naphthalene ( at SB-1 thru SB-4 as proposed) |
| **Area E – representing spill #930211**<br><br>Crude oil<br><br>Tank Area 120-2 | **Surface samples (6" to 12" depth)**<br><br>VOC: 10 samples for BTEX ( at SB-1 thru SB-10)<br><br>PNAs: 4 composite samples, each of 5 discrete sampling points as indicated in proposal diagram.<br><br>**Subsurface samples** (one sample each boring at highest PID reading )<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram) |
| **Area F – representing spills #942288, #941873, #942855, and #951217**<br><br>Crude oil and gasoline<br><br>Tank Area 200-1 | **Surface samples (6" to 12" depth)**<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram).<br><br>**Subsurface samples** (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 8 borings (at SB-1 thru SB-8 as indicated in the proposal diagram). |
| **Area G – representing spill #931160**<br><br>Sulfuric acid<br><br>Cooling Tower #5 Area | **Surface samples (0-12")**<br><br>pH: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram). |

| | |
|---|---|
| Area H -- representing spill #941913, #942188<br><br>Gasoil<br><br>Area adjacent to Hawthorn Avenue where feed supply lines cross to connect with Tank 120-7 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (of 5 discrete sampling points each as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram). |
| Area J -- representing spill #942432 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX ( only SB-1 thru SB-4 as indicated in proposal diagram)<br><br>PNAs: 2 composite samples (of 2 discrete sampling points each as indicated in proposal diagram, SB-1 thru SB-4).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 6 borings (at SB-1 thru SB-6 as indicated in the proposal diagram). |

As for Area K (representing spill #940515 (asphalt)) and Area L (representing Spills #941701, #950726 and #950893 (gasoil, fuel oil and petroleum leaching)), the Agency has received and reviewed the "Field Investigation Workplan for Groundwater Sampling at Clark Refining and Marketing, Inc. Black Oil River Line Release area" dated June 1995 pertaining to Area K and the "Site Assessment Report - Hartford River Terminal for Clark Refining and Marketing, Inc. Hartford, Illinois" dated December 1995 pertaining to Area L. Pursuant to Clark's proposed field investigation workplan and site assessment report for sites "K" and "L", the Agency requests that the wells from each of these sites be sampled and monitored for at least three years. The sampling and monitoring frequency for the first year shall be on a quarterly basis, the second year on a semi-annual basis, and annually thereafter. Sampling shall continue until three consecutive sets of sample data show levels below groundwater quality standards or groundwater cleanup objectives approved by the Agency. The sample parameters proposed by Clark's consultant are acceptable.

In addition, soil boring and sampling results from Area L taken from the December 1995 site assessment report have indicated that volatile samples from selected soil borings are in excess of the TACO Class I soil cleanup objectives. Clark shall provide the Agency with a workplan to address these soils at Area L (River Terminal Location).

The agreed schedule is that Clark shall send final plans for Agency approval two weeks after receipt of this letter. The Agency shall in one week following its receipt of the plans. The plans should be sent to Jim O'Brien with a copy to me. If you have any questions, please do not hesitate to call.

Very truly yours,

James L Morgan

James L. Morgan
Senior Assistant Attorney General
Environmental Bureau, Springfield

enc.

pc: Jim O'Brien
John Waligore

JLM:jm

1190S0002
Clark Oil
SR/Tech

CLARK

REFINING & MARKETING, INC.

201 East Hawthorne
Hartford, Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

Source: IEPA BOL

April 7, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Division of Environmental Programs
Illinois Environmental Protection Agency
2200 Churchill Road, P.O. Box 19276
Springfield, IL 62794

Re: State vs. Clark, PCB 95-163

Dear Mr. O'Brien,

Please find attached a copy of the Burns & McDonnell Waste Consultants, Inc. report entitled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery dated April 1997. This report summarizes the field sampling activities and analytical results for Areas A through H, and Area J at the Clark Hartford Refinery. Field activities were conducted in accordance with the sampling and analysis plans approved by the Illinois EPA.

The preliminary findings show that Clark's remediation efforts have been successful. Selected areas may require further evaluation. We believe the remediation goals should take into account the former and future industrial use of the sites and the minimal risk of exposure to the public. If you have any questions, feel free to contact Bill Irwin at (618) 254-7301 ext. 266.

Sincerely,

Forrest B. Lauher
Refinery Manager

Enclosure

cc: John Sherrill
Tom Powell
Tom Miller

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APR 9 1997
IEPA/DLPC

SCREENED

CLARK

Sorrce: IEPA BOL

# SUMMARY REPORT:
# SURFACE AND SUBSURFACE INVESTIGATIONS OF SPILLS AT THE CLARK HARTFORD REFINERY
# FOR
# CLARK REFINING AND MARKETING, INC.
# HARTFORD REFINERY
# HARTFORD, ILLINOIS

SEPTEMBER 1996

**Project No. 94-155-4-056**



**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

TABLE OF CONTENTS

# INTRODUCTION

This report presents the results of nine separate surface and subsurface investigations associated with reported spills at the Clark Refining and Marketing, Inc.'s (Clark) Hartford, Illinois Refinery. These spills occurred between December 6, 1991 and July 7, 1995 at or near the Hartford Refinery. Clark's Hartford Refinery is located in Hartford, Illinois, approximately 10 miles north of St. Louis, Missouri.

The site investigation reports included herein present data obtained as a result of soil sample collection and analysis conducted as part of Clark's efforts to investigate areas impacted by these documented releases. Soil sampling and analysis at each site was conducted according to the site specific Sampling and Analysis Plan generated by Burns & McDonnell Waste Consultants, Inc. (BMWCI) and approved by the Illinois Environmental Protection Agency. BMWCI personnel provided oversight of all field activities described in the following reports.

# SITE INVESTIGATION REPORT
# FOR
# AREA E
# TANK 120-2 SPILL AREA
# ILLINOIS EPA SPILL NO. 930211
# CLARK REFINING AND MARKETING, INC.
# HARTFORD, ILLINOIS

AUGUST 1996

94-155-4-056

**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

## TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 GENERAL

The following describes the site investigation activities used to further characterize the condition of the Tank 120-2 diked area (Site) for Clark Refining & Marketing, Inc. (Clark) in Hartford, Illinois. The results of this characterization were used, in addition to previous surface sampling conducted in October, 1995, to determine the approximate vertical and horizontal extent of subsurface contamination at the Site due to this release (Illinois Environmental Protection Agency Spill #930211). This site investigation report provides: site geology and hydrology, a description of the field work performed; methods, procedures, and analyses used; chemical analytical data; and a summary of contaminant occurance. The location of the Site is illustrated on Figure 1.

## 1.2 SITE HISTORY AND DESCRIPTION

This spill occurred when a rupture disc on the foam system for Tank number 120-2 failed. When this system failed, crude oil flowed into the foam line and out of a low point drain on that line. The drain was open on the foam system line as a freeze precaution to prevent the line from splitting because of condensation within the pipe. The root cause of this event was a design mistake which allowed the installation of incorrect rupture discs which failed at a pressure lower than the head pressure of the tank. This event resulted in a total quantity of 750 barrels of crude oil being released into the secondary containment diked area. Figure 2 shows the impacted area.

Clark estimates based on first hand oral accounts, between twenty-five and thirty vacuum truck loads of material were recovered from this area. Each vacuum truck holds approximately 50 barrels of material. Hence, between 1250 barrels and 1500 barrels of crude oil and water were recovered. The oil was reprocessed through the crude unit and the water was treated in the aggressive biological waste water treatment process. The processes of product and water recovery, along with the high viscosity of the released material, suggests to Clark that they were able to recover all the oil with the exception of a few gallons. A more detailed description of the previous sampling activities and the laboratory results is contained in the Burns & McDonnell Waste Consultants, Inc. (BMWCI) report <u>Summary Report of Spills at the Clark Hartford Refinery for Clark Refining and Marketing, Inc.</u> of November 1995.

* * * * *

# 2.0 HYDROGEOLOGY

## 2.1 REGIONAL HYDROGEOLOGY

The Site lies within the Alluvial Valleys Region as defined in United States Geological Survey Water-Supply Paper 2242, 1984. The Alluvial Valleys Region is commonly underlain by sand and gravel as well as silt and clay. The surficial deposit of sand and gravel is commonly underlain by interbedded silt and clay in turn underlain by a basal layer of sand and gravel. Locally, these units are collectively known as Cahokia Alluvium. The subsurface material in the Site area consists of Quarternary Alluvium, which is made up of modern river floodplain deposits of poorly-sorted sands, silts, and clays with some sandy gravel. The alluvium ranges in thickness from 50 to 200 feet below the ground surface (bgs).

The sequence of deposits in the Alluvial Valleys Region is dependant on the depositional history. The sands and gravels in the valleys of major streams, such as the Mississippi River, are commonly overlain by deposits of clay and other fine-grained alluvium deposited during floods following the end of the glacial period.

The alluvial deposits are recharged by precipitation on the valleys, groundwater moving from the adjacent and underlying aquifers, and overbank flooding of the streams. Water in the alluvial deposits discharges to the streams in the valleys.

The underlying bedrock in the Hartford area is composed of Mississippian age interbedded limestones, sandstones, and shales of the Lower Chesterian Series. Regionally, these units dip east toward the center of the Illinois Basin. The Illinois Basin is the major geologic structure in the region.

## 2.2 LOCAL HYDROGEOLOGY

Soil borings were completed to a maximum of 6 feet below ground surface (bgs) at this location. Sediments encountered during drilling included mainly yellowish brown to grey and black silty clays with a sandy unit in the vicinity of SB-6. Groundwater was not encountered during drilling. Soil boring logs are included as Appendix A.

* * * * *

# 3.0 FIELD INVESTIGATION ACTIVITIES

To determine the approximate vertical and horizontal extent of petroleum hydrocarbons at the Site, fourteen surface soil samples were collected and ten soil borings were drilled and sampled. The sampling locations were concentrated around Tank 120-2 and are shown on Figure 2.

## 3.1 SURFACE SOIL SAMPLE COLLECTION

To determine the presence of surface contaminants in the vicinity of the release, ten surface soil samples were collected and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (EPA) Method 8020, and four composite surface samples were collected and analyzed for Polynuclear Aromatic Hydrocarbons (PNAs) by EPA Method 8310. Surface soil samples were collected at a depth of 6 inches below ground surface to insure sampling of native soil. Soil samples were placed in laboratory-cleansed jars after collection.

## 3.2 DRILLING AND SUBSURFACE SOIL SAMPLE COLLECTION

Ten soil borings were drilled in the vicinities of Tank 120-2. The first 2.5 feet of each boring was field screened with a photoionization detector (PID). Each boring was completed to a depth of 5 feet below the highest PID reading, as measured in the top 2.5 feet. Soil borings were drilled using an all terrain vehicle (ATV) mounted drill rig with hollow stem augers and were continuously sampled using split spoon samplers. Drilling logs are included in Appendix A.

Subsurface soil samples were collected from the location of the highest PID reading and from the bottom of the boring. If no PID readings were recorded for a boring, a sample was collected from the bottom of the boring only. Soil samples were removed from the samplers with minimal disturbance and placed in laboratory-cleansed jars. Subsurface soil samples were analyzed for BTEX by EPA Method 8020 and PNAs by EPA Method 8310.

## 3.3 SAMPLE COLLECTION PROTOCOL

Personnel responsible for activities associated with collection of soil samples followed standard procedures to reduce the possibility of contamination and cross-contamination of the samples prior to delivery to the laboratory. Clean, decontaminated sampling equipment was used at each sampling location. Soil samples were placed in a cooler with ice and promptly delivered to the analytical laboratory using chain-of-custody procedures. All laboratory analyses were performed in accordance with EPA methodology by American Technical and Analytical Services, Inc., of Maryland Heights, Missouri. The laboratory results and chain-of-custody forms for surface soil samples are included in Appendix B.

## 4.0 CONTAMINANT OCCURRENCE

Fourteen surface and eleven subsurface soil samples were collected and submitted for laboratory chemical analysis to delineate the approximate horizontal and vertical extent of soil impacted by petroleum hydrocarbons at the site. The analytical laboratory reports are contained in Appendix B.

### 4.1 SURFACE SOIL SAMPLES

Of the ten surface soil samples analyzed for BTEX constituents, none exceed the Illinois EPA Tiered Approach to Cleanup Objectives (TACO) Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties. Of the four surface soil composite samples, only S-13 exceeds TACO Tier 1 values for PNAs. Results for surface soil sample analyses are summarized in Table 1.

### 4.2 SUBSURFACE SOIL SAMPLES

Eleven subsurface soil samples were collected and submitted for laboratory analysis of BTEX by EPA Method 8020 and PNAs by Method 8310. All eleven subsurface soil samples are below TACO Tier 1 values for all BTEX constituents. In addition, all eleven subsurface soil samples are below TACO Tier 1 values for all PNAs. Results for subsurface soil sample analyses are summarized in Table 2.

* * * * *

## 5.0 CONCLUSIONS

- No free petroleum product was encountered during soil sampling.

- All surface soil samples are below TACO Tier 1 values for BTEX constituents.

- Composite surface soil sample S-13 exceeds TACO Tier 1 values for benzo(a)anthracene and benzo(a)pyrene. The presence of elevated levels of PNAs in this sample may be due to the proximity of sample aliquots to the drainage ditch along the eastern edge of the tank yard. This drainage ditch may contain petroleum hydrocarbons from historic contamination.

- All subsurface soil samples are below TACO Tier 1 values for both BTEX and PNAs.

* * * * *

# TABLE 1
## Summary of Surface Analytical Results
## Clark Refining & Marketing, Inc.
## Area E, Tank 120-2 Tank Yard
## Hartford, Illinois

| Sample Number: | | Detection | TACO | S-1 | S-2 | S-3 | S-4 | S-5 | S-6 | S-7 | S-8 | S-9 | S-10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Limits | Tier 1 CUO[1] | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/9( |
| COMPOUND | | | | | | | | | | | | | |
| BTEX | | | | | | | | | | | | | |
| Benzene | µg/Kg | 1 | 20 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Toluene | µg/Kg | 1 | 5,000 | 8 | 9 | 4 | 1 | 3 | 4 | BDL | 4 | BDL | BDL |
| Ethylbenzene | µg/Kg | 1 | 5,000 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Xylenes (total) | µg/Kg | 1 | 74,000 | 3 | 6 | 2 | BDL | BDL | 1 | BDL | BDL | BDL | BDL |
| Total BTEX | µg/Kg | | | 11 | 15 | 6 | 1 | 3 | 5 | BDL | 4 | BDL | BDL |

| Sample Number: | | TACO | S-11 | | S-12 | | S-13 | | S-14 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | |
| PNAs | | | DL | Result | DL | Result | DL | Result | DL | Result |
| Naphthalene | µg/Kg | 30,000 | 660 | BDL | 660 | BDL | 660 | BDL | 2,510 | BDL |
| Acenaphthylene | µg/Kg | NL | 660 | 1,260 | 660 | BDL | 660 | BDL | 2,510 | BDL |
| Acenaphthene | µg/Kg | 200,000 | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 9,000 | BDL |
| Fluorene | µg/Kg | 160,000 | 140 | BDL | 140 | BDL | 140 | BDL | 1,050 | BDL |
| Phenanthrene | µg/Kg | NL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Anthracene | µg/Kg | 4,300,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| .ouranthene | µg/Kg | 980,000 | 660 | BDL | 660 | BDL | 660 | 1,940 | 660 | BDL |
| Pyrene | µg/Kg | 1,400,000 | 180 | BDL | 180 | BDL | 334 | 1,800 | 251 | BDL |
| Benzo(a)anthracene | µg/Kg | 700 | 8.7 | 32.9 | 8.7 | 25.3 | 86.6 | 888* | 65.0 | BDL |
| Chrysene | µg/Kg | 1,000 | 100 | BDL | 100 | BDL | 100 | 398 | 375 | BDL |
| Benzo(b)flouranthene | µg/Kg | 4,000 | 12.0 | 72.4 | 12.0 | 52.2 | 34.0 | 1,270 | 25.5 | 154 |
| Benzo(k)flouranthene | µg/Kg | 4,000 | 11.0 | 12.0 | 11.0 | 14.1 | 16.6 | 458 | 12.5 | 38.7 |
| Benzo(a)pyrene | µg/Kg | 800 | 15.0 | 51.3 | 15.0 | 58.0 | 66.0 | 1,250* | 49.5 | BDL |
| Dibenzo(a,h)anthracene | µg/Kg | 800 | 20.0 | BDL | 20.0 | BDL | 20.0 | 381 | 150** | BDL |
| Benzo(g,h,l)perylene | µg/Kg | NL | 51.0 | BDL | 51.0 | BDL | 51.0 | 332 | 188 | BDL |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 8,000 | 29.0 | BDL | 29.0 | BDL | 29.0 | 281 | 125 | BDL |

1 - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties
BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020
µg/Kg - Microgram per kilogram
BDL - Below detection limit
PNAs - Polynuclear Aromatic Hydrocarbons analyzed by EPA Method SW846-8310
DL - Detection Limit
NL - Compound not listed in TACO Tier 1, Table B
488* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwater)
150** - Detection limit is above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective

## TABLE 2
## Summary of Subsurface Analytical Results
## Clark Refining & Marketing, Inc.
## Area E, Tank 120-2 Tank Yard
## Hartford, Illinois

| Sample Number: | | Detection | TACO | SB-1-5 | SB-2-5 | SB-3-5 | SB-4-5 | SB-5-5 | SB-6-1 | SB-6-6 | SB-7-5 | SB-8-5 | SB-9-5 | SB-10-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Limits | Tier 1 CUO[1] | 06/03/96 | 06/03/96 | 06/03/96 | 06/03/96 | 06/03/96 | 06/03/96 | 06/03/96 | 06/03/96 | 06/04/96 | 06/03/96 | 06/04/96 |
| COMPOUND | | | | | | | | | | | | | | |
| BTEX | | | | | | | | | | | | | | |
| Benzene | µg/Kg | 1 | 20 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Toluene | µg/Kg | 1 | 5,000 | BDL | BDL | BDL | 1 | 2 | BDL | BDL | BDL | 1 | 2 | BDL |
| Ethylbenzene | µg/Kg | 1 | 5,000 | BDL | BDL | BDL | BDL | 2 | 3 | 6 | BDL | BDL | BDL | BDL |
| Xylenes (total) | µg/Kg | 1 | 74,000 | BDL | BDL | BDL | 3 | 7 | BDL | BDL | BDL | BDL | BDL | 1 |
| Total BTEX | µg/Kg | | | BDL | BDL | BDL | 4 | 11 | 3 | 6 | BDL | 1 | 2 | 1 |
| | | | | | | | | | | | | | | |
| PNAs | | | | | | | | | | | | | | |
| Naphthalene | µg/Kg | 660 | 30,000 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Acenaphthylene | µg/Kg | 660 | NL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Acenaphthene | µg/Kg | 1200 | 200,000 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Fluorene | µg/Kg | 140 | 160,000 | BDL | BDL | BDL | BDL | BDL | 320 | BDL | BDL | BDL | BDL | BDL |
| Phenanthrene | µg/Kg | 660 | NL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Anthracene | µg/Kg | 660 | 4,300,000 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Flouranthene | µg/Kg | 660 | 980,000 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Pyrene | µg/Kg | 180 | 1,400,000 | BDL | BDL | BDL | 395 | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Benzo(a)anthracene | µg/Kg | 8.7 | 700 | BDL | BDL | BDL | 181 | BDL | 46.6 | BDL | BDL | BDL | BDL | BDL |
| Chrysene | µg/Kg | 100 | 1,000 | BDL | BDL | BDL | 831 | 327 | 175 | BDL | BDL | BDL | BDL | BDL |
| Benzo(b)flouranthene | µg/Kg | 12.0 | 4,000 | BDL | BDL | BDL | 77.9 | 34.5 | 45.1 | BDL | 12.6 | BDL | BDL | BDL |
| Benzo(k)flouranthene | µg/Kg | 11.0 | 4,000 | BDL | BDL | BDL | 90.3 | 23.4 | 16.2 | BDL | BDL | BDL | BDL | BDL |
| Benzo(a)pyrene | µg/Kg | 15.0 | 800 | BDL | BDL | BDL | 488 | 110 | 53.7 | BDL | BDL | BDL | BDL | BDL |
| Dibenzo(a,h)anthracene | µg/Kg | 20.0 | 800 | BDL | BDL | BDL | 390 | 297 | 23.6 | 40.8 | BDL | BDL | BDL | BDL |
| Benzo(g,h,i)perylene | µg/Kg | 51.0 | NL | BDL | BDL | BDL | 288 | 291 | BDL | 104 | BDL | BDL | BDL | BDL |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 29.0 | 8,000 | BDL | BDL | BDL | 116 | 170 | BDL | BDL | BDL | BDL | BDL | BDL |

1 - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

µg/Kg - Microgram per kilogram

BDL - Below detection limit

PNAs - Polynuclear Aromatic Hydrocarbons analyzed by EPA Method SW846-8310

NL - Compound not listed in TACO Tier 1, Table B

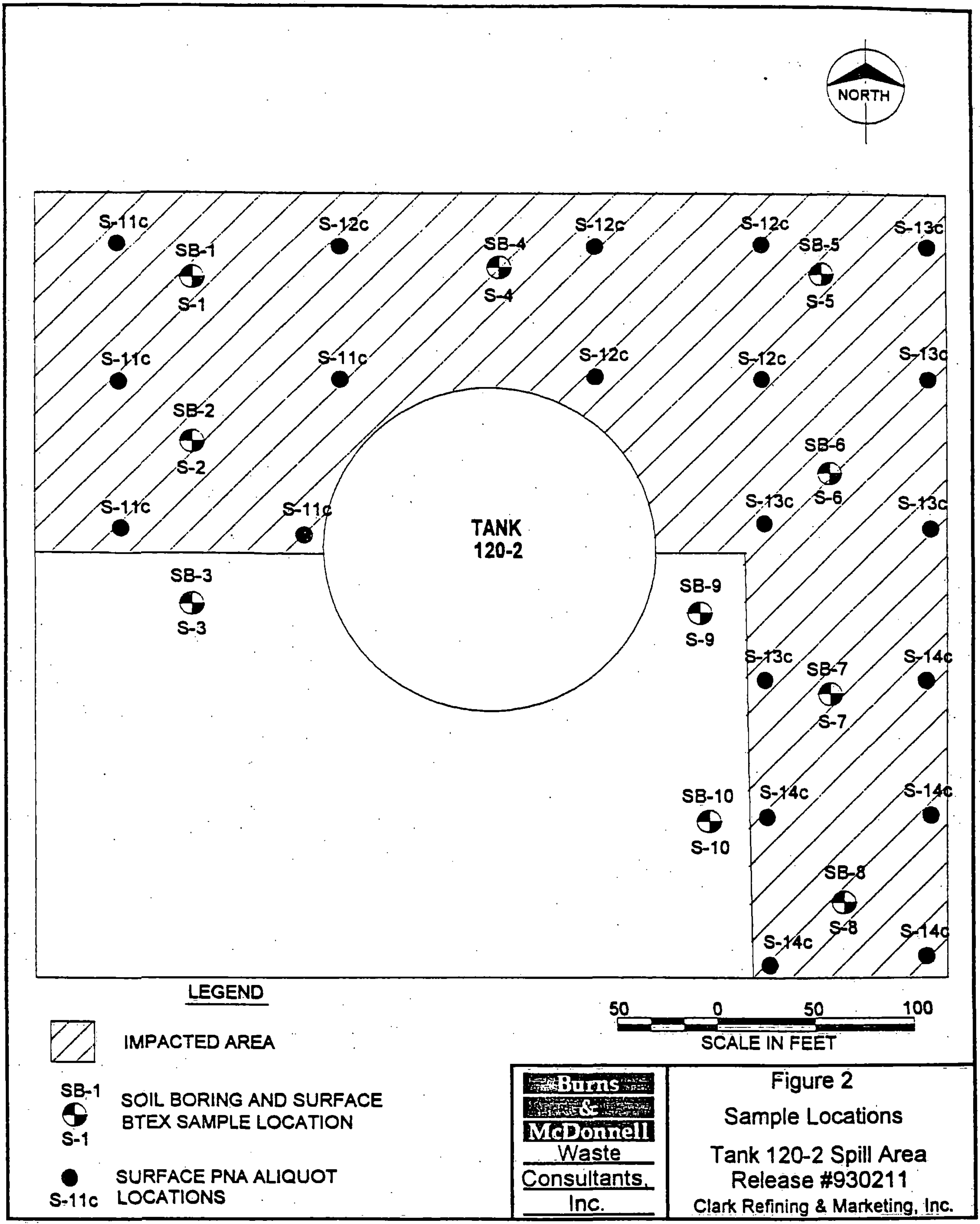


Figure 2
Sample Locations
Tank 120-2 Spill Area
Release #930211
Clark Refining & Marketing, Inc.

FILE

FILE NUMBER 070.20.01.08 080.58.47

RETAIN IN FILE UNTIL

CLARK

201 East Hawthorne
Hartford Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

November 10, 1997

Mr. Jim O'Brien, Manager
Office of Chemical Safety
Illinois Environmental Protection Agency
P.O. Box 19726
Springfield, IL 62794-9726

Re: Tiered Approach Objective Assessment

Dear Mr. O'Brien,

Enclosed is a copy of the Tiered Approach Objective assessment for the spill sites at the Hartford Refinery that was prepared by Burns & McDonnell. Clark Refining and Marketing, Inc. will provide your department with remediation techniques for two of the remaining sites in the near future.

Please call me at 618-254-7301, extension 218 with your questions.

Sincerely,

M. Modarres

Massood Modarres
Environmental Engineer

cc: John Sherrill
Tom Miller
File ✓

Burns & McDonnell Waste Consultants, Inc.

November 3, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery: IEPA Spill Nos. 940851, 941772, 942837, 941526, 930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this Tiered Approach to Cleanup Objectives (TACO) assessment of the above-listed spill sites at the Clark Hartford Refinery. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. In this letter report, the data compiled in the September 1996 report for each spill site is evaluated for compliance with TACO Tier I and Tier II cleanup objectives.

## SOIL SAMPLES

Soil sample analytical data for surface and subsurface samples is summarized in Tables 1 and 2, respectively. Tables 1 and 2 are condensed from the September 1996 report and list only the contaminants detected at each spill site in excess of TACO Tier I Cleanup Objectives for Industrial/Commercial properties. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. Spill areas are shown on a map of the refinery, included as Figure 1. Samples from areas that are not listed in the tables were all below the Industrial/Commercial cleanup objectives. TACO Tier 1 Exposure-Route Specific Values for Soils are summarized for the contaminants of concern in Table 3 for the Industrial/Commercial, Construction Worker, and Migration to Groundwater scenarios.

In addition to the soil sampling completed for the September 1996 report, soil samples were collected September 23, 1997 from four areas for analysis of organic carbon. Soil samples were collected from two locations each in Areas B, C, H, and J, and analyzed for

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Fenton, Missouri 63026

Phone: 314 305-0077
Fax: 314 326-8295
http://www.burnsmcd.com

Organic Matter using ASTM D2974-87 and for Total Organic Carbon using EPA SW-846. The samples were collected from below the contaminated zone at depths ranging from 7 to 12 feet below ground surface. Analytical data is presented in Table 4. Although both methods are approved for determination of the fraction of organic carbon ($f_{oc}$), the site-specific $f_{oc}$ values used for this assessment were calculated from the ASTM method of analyzing for organic matter. These values are also presented in Table 4.

**TIER II CLEANUP OBJECTIVES**

The site-specific $f_{oc}$ was evaluated for Areas B, C, H, and J so that site-specific cleanup objectives could be calculated for the Migration to Groundwater pathway. The TACO Tier I cleanup objectives given in TACO Appendix B, Table A for the Migration to Groundwater pathway are calculated for subsurface soil samples with a default $f_{oc}$ value of 0.002 gm/gm. Table 5 presents the site-specific cleanup objectives for the Migration to Groundwater pathway in addition to the surface and subsurface soil default objectives. The site-specific cleanup objectives were calculated using Equation S17 in TACO Appendix C, Table A. Default values for clay soil were used for density and porosity values.

To use calculated site-specific cleanup objectives, TACO specifies three additional concentration limits that cannot be exceeded for a site:

- the soil saturation limit for each chemical (calculated according to Section 742.220) cannot be exceeded,

- the soil attenuation capacity for each site (calculated according to Section 742.215) cannot be exceeded, and

- a weighted average of 1 (calculated according to Section 742.720) cannot be exceeded at each site for chemicals that target the same organ.

According to TACO Table E in Appendix A, the contaminants of concern to this study that target the same organ include only toluene and ethylbenzene, which both target the kidneys. These contaminants are present together above TACO Tier 1 Industrial/Commercial cleanup objectives for Area B only. Of the 8 samples listed in Table 1, the weighted average exceeds 1 for samples S-1 and S-13.

The soil attenuation capacity is represented by the organic carbon concentration in the soil at each site. The total concentration of all organic contaminants of concern at a site is

compared to the total organic material in the soil at that site. The total organic contaminant concentrations for all areas discussed in this assessment fall below the default organic matter concentration of 2000 milligrams per kilogram (mg/kg). (Please refer to the September 1996 report for complete soil analytical data.)

Soil saturation limits for benzene, toluene, ethylbenzene, and xylenes (BTEX) are given in TACO Appendix A, Table A. As indicated in the footnotes of Table 5, soil saturation limits are used as cleanup objectives when calculated objectives exceed the saturation limits.

**TIER II ASSESSMENTS**

In the following pages, each area is individually evaluated relative to the calculated TACO Tier II cleanup objectives presented in Table 5. All of the areas discussed in this assessment are areas that do not support full-time workers or structures. Clark personnel are present in the areas only intermittently and these areas are not generally accessible to the public. It is therefore reasonable at each of these sites that the construction worker scenario be used for the ingestion and inhalation cleanup objectives.

Each of the assessment pages in Attachment A addresses the status of a single area. The contaminants of concern (COCs) in both surface and subsurface soil are represented by the highest concentration for each in that area (refer to Tables 1 and 2 for complete soil sample information). In cases were detection limits exceed the cleanup objectives, non-detect samples are considered to be in excess of the cleanup objectives. The limiting scenario(s) for each area are determined by selecting the most conservative cleanup objectives from Table 5. The Tier II assessment for each area is then a direct comparison of the site data with the most conservative site-specific cleanup objectives.

**SUMMARY**

TACO assessment of each of the areas at the Clark Refinery, as shown in Attachment A, indicates that Areas A, E, F, G, and H are all below TACO Tier II cleanup objectives for the applicable contaminant pathway scenarios. These areas do not require further assessment or remediation.

Area B, surrounding Tank 35-2 in the tank yard, has surface and subsurface concentrations of BTEX constituents that exceed the TACO Tier II cleanup objectives. The cleanup objectives for this area include the calculated site-specific concentration for benzene (migration to groundwater pathway), and the construction worker scenario concentrations for TEX.

Burns & McDonnell | Waste Consultants, Inc.



Area C, surrounding Tank 55-1 in the tank yard, has subsurface soil concentrations of benzene in two samples that exceed the Tier II cleanup objectives. The benzene cleanup objective for this area is a calculated site-specific concentration for the migration to groundwater pathway.

Area D, surrounding Tank 10-5 in the tank yard, has surface and subsurface soil concentrations of benzene that exceed Tier II cleanup objectives. The benzene cleanup objectives for this area are the generic TACO Tier I values, migration to groundwater pathway, for surface and subsurface soil.

Area J, along Illinois Route 3, has two subsurface soil samples in excess of the Tier II cleanup objectives for benzene, and one subsurface soil sample in excess of the Tier II cleanup objectives for benzo(b)fluoranthene and dibenzo(a,h)anthracene. The cleanup objectives for this area are calculated site-specific concentrations, migration to groundwater pathway, for these three contaminants.

If you have any questions concerning this assessment, please contact me at (314) 305-0077, ext. 226.

Sincerely,

Paul Christian

Paul Christian
Project Manager

attachment

# Table 1
## Tier II Surface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area A | | Area B | | | | | | | | Area C | Area D | | Area E | Area J | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S-5 | S-6 | S-1 | S-3 | S-6 | S-8 | S-9 | S-10 | S-13 | S-14 | S-8 | S-2 | S-4 | S-13 | SB-5S | SB-6S |
| Benzene | -- | -- | 6.6 | 3.9 | 0.036 | 2.4 | 12 | 0.26 | 53 | 0.1 | -- | 0.27 | 3.1 | -- | -- | -- |
| Toluene | -- | -- | 69 | -- | -- | -- | 63 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | 36 | -- | -- | -- | 19 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | >75 | 110 | -- | 90 | >75 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | 1.21 | 0.851 | -- | -- | -- | -- | -- | -- | -- | -- | 2.90 | -- | -- | 1.25 | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | 1.03 | 2.25 | -- | -- | -- | -- | -- | -- | -- | -- | 4.28 | -- | -- | -- | 2.10 | 1.15 |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 2
## Tier II Subsurface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area B | | | | | | | | | Area C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-1 | SB1-5 | SB2-2 | SB3-2 | SB3-7 | SB4-2 | SB4-7 | SB5-5 | SB7-5 | SB1-2 | SB1-7 | SB3-2.5 | SB3-7.5 |
| Benzene | 3.2 | <1.25 | <1.25 | 2.7 | 0.33 | <1.25 | 0.062 | <0.125 | 0.38 | 0.17 | -- | 0.27 | 1.5 |
| Toluene | 15 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | 16 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | >75 | -- | -- | >75 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.971 | -- | -- |

| | Area D | | | | | | | | Area H | Area J | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-2 | SB1-7 | SB2-1 | SB2-6 | SB3-1 | SB3-6 | SB4-2 | SB4-7 | SB1-2 | SB1-8 | SB1-13 | SB3-8 | SB3-13 |
| Benzene | 0.16 | 4 | 0.24 | 0.87 | 0.13 | 0.21 | 0.11 | 2.6 | 0.059 | 0.034 | -- | <0.125 | 0.2 |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.94 | -- | 4.09 | 3.93 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 23.30 | -- | -- | 5.65 |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.9 | 1.28 | 1.92 | 1.78 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 238 | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 18.2 | 2.37 | 3.97 | 3.08 |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 3
## Exposure-Route Specific Values for Soils
## Illinois Tiered Approach to Cleanup Objectives

| | Industrial/Commercial | | Construction Worker | | Migration to |
|---|---|---|---|---|---|
| | Ingestion | Inhalation | Ingestion | Inhalation | Groundwater |
| Benzene | 200 | 1.5 | 4,300 | 2.1 | 0.03 |
| Toluene | 410,000 | 650 | 410,000 | 42 | 12 |
| Ethylbenzene | 200,000 | 400 | 20,000 | 58 | 13 |
| Xylenes | 1,000,000 | 410 | 410,000 | 410 | 150 |
| Benzo(a)anthracene | 8 | – | 170 | – | 2 |
| Benzo(b)fluoranthene | 8 | – | 170 | – | 5 |
| Benzo(a)pyrene | 0.8 | – | 17 | – | 8 |
| Chrysene | 780 | – | 17,000 | – | 160 |
| Dibenzo(a,h)anthracene | 0.8 | – | 17 | – | 2 |

* All sample data reported in milligrams per kilogram (mg/kg)

**All information reproduced from Title 35, Subtitle G, Chapter I, Subchapter f, Part 742, Appendix B, Table B

# Table 4
## Summary of Fraction Organic Carbon Analysis
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| Sample Location & Number | Sample Date | Organic Matter ASTM D2974-87 | Tot. Organic Carbon EPA SW-846 | Average Fraction Organic Carbon[1] |
|---|---|---|---|---|
| Area B - 1 | 09/23/97 | 15,000 | 830 | |
| Area B - 2 | 09/23/97 | 13,900 | 5952 | 0.0145 |
| Area C - 1 | 09/23/97 | 10,800 | 5353 | |
| Area C - 2 | 09/23/97 | 14,800 | 1107 | 0.0128 |
| Area H - 1 | 09/23/97 | 14,600 | 2288 | |
| Area H - 2 | 09/23/97 | 2,570 | 5371 | 0.0089 |
| Area J -1 | 09/23/97 | 7,800 | 2578 | |
| Area J - 2 | 09/23/97 | 2,300 | 2411 | 0.0051 |

* All sample data reported in milligrams per kilogram (mg/kg)

[1] = Average is calculated using ASTM Method data only.

# Table 5
## Tier II Cleanup Objectives - Soil
## Industrial/Residential Scenario
## Migration to Groundwater Pathway
## Illinois Tiered Approach to Cleanup Objectives

| | TACO Generic Cleanup Objectives | | Site Specific Cleanup Objectives | | | |
|---|---|---|---|---|---|---|
| | Surface | Subsurface | Area B | Area C | Area H | Area J |
| | (foc =0.006) | (foc = 0.002) | (foc = 0.015) | (foc = 0.013) | (foc = 0.009) | (foc = 0.005) |
| Benzene | 0.09 | 0.03 | 0.225 | 0.195 | 0.135 | 0.075 |
| Toluene | 36 | 12 | 90 | 78 | 54 | 30 |
| Ethylbenzene | 39 | 13 | 97.5 | 84.5 | 58.5 | 32.5 |
| Xylenes | 410** | 150 | 410** | 410** | 410** | 375 |
| Benzo(a)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |
| Benzo(b)fluoranthene | 15 | 5 | 37.5 | 32.5 | 22.5 | 12.5 |
| Benzo(a)pyrene | 24 | 8 | 60 | 52 | 36 | 20 |
| Chrysene | 480 | 160 | 1,200 | 1,040 | 720 | 400 |
| Dibenzo(a,h)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |

* All sample data reported in milligrams per kilogram (mg/kg)

** Cleanup Objective calculations are limited by the soil saturation concentration (410 mg/kg)

**ATTACHMENT A**

TACO Tier II Assessment Sheets

| | | |
|---|---|---|
| LOCATION: | Area A - NW of Biological Treatment Unit | |
| MEDIA: | Soil | |
| CLASSIFICATION: | ~~Industrial/Commercial with no full time~~ workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 1.21 mg/kg |
| | Dibenzo(a,h)anthracene | 2.25 mg/kg |
| COCs - SUBSURFACE: | N/A | |
| LIMITING SCENARIO: | Migration to Groundwater (generic surface): | |
| | Benzo(a)pyrene | 24 mg/kg |
| | Dibenzo(a,h)anthracene | 6 mg/kg |

TIER II ASSESSMENT:

Surface soil concentrations of both benzo(a)pyrene and dibenzo(a,h)anthracene are below the cleanup objectives for both the construction worker scenario and the migration to groundwater scenario.

| | | |
|---|---|---|
| LOCATION: | Area B - Tank 35-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial Commercial with no full time workers and no structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 53 mg/kg |
| | Toluene | >75 mg/kg |
| | Ethylbenzene | >75 mg/kg |
| | Xylenes | >75 mg/kg |
| COCs - SUBSURFACE: | Benzene | 3.2 mg/kg |
| | Toluene | 15 mg/kg |
| | Ethylbenzene | 16 mg/kg |
| | Xylenes | >75 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.225 mg/kg |
| | Construction Worker: | |
| | Toluene | 47 mg/kg |
| | Ethylbenzene | 58 mg/kg |
| | Xylenes | 410 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-1, S-3, S-8, S-9, S-10, and S-13 are in excess of the limiting scenario cleanup objective for benzene; surface soil samples S-1, S-9, and S-13 exceed the objective for toluene; surface soil sample S-13 exceeds the ethylbenzene objective, and surface soil samples S-1, S-9, and S-13 exceed the xylenes cleanup objective. In addition, the weighted average of toluene and ethylbenzene concentrations exceed 1 for soil samples S-1 and S-13.

Subsurface soil samples SB1-1, SB1-5, SB2-2, SB3-2, SB3-7, SB4-2, and SB7-5 are in excess of limiting scenario cleanup objectives for benzene. Subusurface soil samples SB1-1 and SB3-2 are potentially in excess of the cleanup objective for xylenes.

| | | |
|---|---|---|
| LOCATION: | Area C - Tank 55-1 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full-time workers or structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 2.90 mg/kg |
| | Dibenzo(a,h)anthracene | 4.28 mg/kg |
| COCs - SUBSURFACE: | Benzene | 1.5 mg/kg |
| | Dibenzo(a,h)anthracene | 0.971 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.195 mg/kg |
| | Dibenzo(a,h)anthracene | 13 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below cleanup objectives for both the construction worker scenario (Table 3) and the site-specific migration to groundwater scenario (Table 5).

Subsurface soil samples SB3-2.5 and SB3-7.5 are in excess of the migration to groundwater scenario benzene cleanup objective. All subsurface soil samples are below cleanup objectives for dibenzo(a,h)anthracene.

LOCATION: Area D - Tank 10-5

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full-time workers and no structures. Use construction worker scenario.

COCs - SURFACE: Benzene 3.1 mg/kg

COCs - SUBSURFACE: Benzene 4.0 mg/kg

LIMITING SCENARIO: Migration to Groundwater (generic):
Benzene (surface) 0.09 mg/kg
Benzene (subsurface) 0.03 mg/kg

TIER II ASSESSMENT:

Surface soil samples S-2 and S-4 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

Subsurface soil samples SB1-2, SB1-7, SB2-1, SB2-6, SB3-1, SB3-6, SB4-2, and SB4-7 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

| | | |
|---|---|---|
| LOCATION: | Area E - Tank 120-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 1.25 mg/kg |
| COCs - SUBSURFACE: | NA | |
| LIMITING SCENARIO: | Construction Worker:<br>Benzo(a)pyrene | <br>17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario for benzo(a)pyrene.

All subsurface soil samples are below all cleanup objectives for both the construction worker and migration to groundwater scenarios.

LOCATION: Area F - Tank 200-1

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

All surface and subsurface soil samples are below all applicable cleanup objectives.

LOCATION: Area G - Sulfuric Acid Spill Area

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

Surface soil samples were analyzed for pH and found to be within the normal limits for soil acidity.

LOCATION: Area H - Hawthorne

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario.

COCs - SURFACE: NA

COCs - SUBSURFACE: Benzene 0.059 mg/kg

LIMITING SCENARIO: Migration to Groundwater (site-specific):
Benzene 0.135 mg/kg

TIER II ASSESSMENT:

All surface soil samples are below all applicable TACO Tier I cleanup objectives.

All subsurface soil samples are below the site-specific migration to groundwater cleanup objective calculated for benzene.

| | | |
|---|---|---|
| LOCATION: | Area J - Route 3 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Dibenzo(a,h)anthracene | 2.10 mg/kg |
| COCs - SUBSURFACE: | Benzene | 0.20 mg/kg |
| | Benzo(a)anthracene | 4.94 mg/kg |
| | Benzo(b)fluoranthene | 23.3 mg/kg |
| | Benzo(a)pyrene | 9.9 mg/kg |
| | Chrysene | 238 mg/kg |
| | Dibenzo(a,h)anthracene | 18.2 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.075 mg/kg |
| | Benzo(a)anthracene | 5 mg/kg |
| | Benzo(b)fluoranthene | 12.5 mg/kg |
| | Chrysene | 400 mg/kg |
| | Dibenzo(a,h)anthracene | 5 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario and the site-specific migration to groundwater scenario.

Subsurface soil samples SB3-8 and SB3-13 are in excess of the site-specific migration to groundwater cleanup objectives for benzene. Subsurface soil sample SB1-8 is in excess of the migration to groundwater cleanup objectives for both benzo(b)fluoranthene and dibenzo(a,h)anthracene.

## APPENDIX P-4

**TANK 10-5 RELEASE**
**MAY 28, 1994**

FILE NUMBER 070.05

RETAIN IN FILE UNTIL 12/97

# CHEMICAL SPILL REPORTING FORM

## SECTION 1

DATE SPILL OCCURRED: 5/25/94 TIME: 10:45 AM
AREA OR PLANT LOCATION: 10-5 TANK
MATERIAL RELEASED: ALKYLATE + REFORMATE

## SECTION 2

CHEMICAL COMPOSITION:

| CONSTITUENT | APPROXIMATE AMOUNT |
|---|---|
| ALKYLATE + REFORMATE GASOLINE STREAMS | 50 BBLS (FIFTY) |

| SUBSTANCE RELEASED TO: | | AMOUNT (LBS) |
|---|---|---|
| AIR: | ✓ | |
| LAND: | ✓ | |
| STORMWATER: | | |

## SECTION 3

DESCRIPTION AND CAUSE OF RELEASE: OVERFILL OF 10-5 TANK - MYSELF + OIL PITCHER WERE SEARCHING FOR FLASH PROBLEM IN #2 PIT AND LOST SIGHT OF FILLING TANK.

PERSONNEL REPORTING RELEASE: DENNIS M. CROWN

SUPERVISING AREA PERSONNEL PRESENT: SAME

ENVIRONMENTAL PERSONNEL PRESENT: NONE

WAS ENVIRONMENTAL IMMEDIATELY INFORMED? ☒ YES ☐ NO

CONTAINMENT AND CLEAN-UP MEASURES: WHAT GASOLINE DID NOT EVAPORATE WAS VACUUMED UP IMMEDIATELY BY VACUUM DRIVER.

MATERIAL CONTAINERIZED ACCORDING TO ENVIRONMENTAL DEPARTMENTS RECOMMENDATION: ☐ YES ☒ NO

SIGNATURE (area superintendent):

## SECTION 4 (Environmental Department's Responsibility)

LIST ANY REGULATORY AGENCY'S INFORMED AND TIME: ~~None~~

ORIGINAL TO:
COPIES TO:

# APPENDIX P-5

## AREA D TANK 10-5 SPILL AREA
## IEMA INCIDENT 941526

# OFFICE OF THE ATTORNEY GENERAL
STATE OF ILLINOIS

March 11, 1996

Jim Ryan
ATTORNEY GENERAL

Pat Sharkey
Mayer, Brown and Platt
190 South LaSalle Street
Chicago, IL 60603-3441

RE: Clark Hartford / Spill Sampling Plan Revision Approvals

Dear Ms. Sharkey:

I am writing to confirm the Agency's acceptance of the plan for sampling that was discussed at a meeting held on February 27, 1996 between representatives of the State and Clark. Initially, Burns & McDonnell had prepared a Sampling and Analysis Plan for Areas B, C, D, F, H, and J. In my letter dated January 16, 1996, to you we proposed additional sampling in Areas A, E, and G as well as groundwater sampling in Areas K and L. At the February 27, 1996, meeting, representatives of Clark presented the State with a two page table of proposals for sampling at the various areas in response to the issues raised in my letter. Further discussions at that meeting resulted in an apparent agreement regarding a sampling plan acceptable to all parties. Following are the specifics of that plan as it is understood by the Illinois EPA representatives.

| | |
|---|---|
| Area A – representing spill #940851<br><br>Asphalt spill<br><br>Northwest of Bio Unit | Surface samples (one foot below post-cleanup fill interface)<br><br><u>VOC: 4 samples for BTEX</u><br><br><u>PNAs: 3 samples for analysis:</u> One from S-1, a composite of S-2 and S-3, and one from S-4. S-1 and S-4 are intended to be collected just outside the previously remediated area to the south and north respectively. |

| | |
|---|---|
| **Area B -- representing spill #941772**<br><br>**Gasoline spill from mixer failure at Tank 35-2**<br><br>**Tank Area 35-1 & -2** | **Surface samples (6" to 12" depth)**<br><br>**<u>VOC: 7 samples for BTEX</u> (SB-1 thru SB-5 as proposed, and two more north and south of SB-3 in line with SB-2, SB-5 and SB-1, SB-4 respectively)**<br><br>**Subsurface samples (two samples each, collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)**<br><br>**<u>VOC: 5 borings each for BTEX</u> (at proposed SB-1 thru SB-5)** |
| **Area B -- representing spill #941772**<br><br>**Gasoline spill from mixer failure at Tank 35-2** 5<br><br>**Tank Area 35-3** | **Surface samples (6" to 12" depth)**<br><br>**<u>VOC: 7 samples for BTEX</u> (5 samples in area affected in east ½ of Tank Area and 2 samples from that part not apparently impacted within the tank dike area)**<br><br>**Subsurface samples (two samples each, collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)**<br><br>**<u>VOC: 2 borings for BTEX</u> (both in area affected in East ½ of Tank Area)** |
| **Area B -- representing spill #941772**<br><br>**Gasoline spill from mixer failure at Tank 35-2**<br><br>**Tank Area 55-1** | **Consolidated with requirements for Area C, since same tank farm affected.** |
| **Area C -- representing spills #942837 and #941772**<br><br>**Gasoil overfill of Tank 55-1 and overflow of gasoline spill from drainage from Tank Area mixer failure at Tank 35-2**<br><br>**Tank Area 55-1** | **Surface samples (6" to 12" depth)**<br><br>**<u>VOC: 7 samples for BTEX</u> (4 at SB-1 thru SB-4 and three others: one located between SB-3 and SB-4, one collected between the pipe rack and tank 55-1 adjacent to the easternmost aspect of that tank, and one collected between SB-1 and SB-2)**<br><br>**<u>PNAs: 4 composite samples</u>, each of 5 discrete sampling points, as indicated in proposal diagram.**<br><br>**Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)**<br><br>**<u>BTEX and PNAs: 4 borings</u> (at SB-1 thru SB-4 as indicated in the proposal diagram)** |

| | |
|---|---|
| Area D -- representing spill #941526<br><br>Naphtha and toluene<br><br>Tank Area 10-5 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX and Naphthalene (2 at five to ten feet on either side [east & west] of SB-3 and 2 more collected between east-center of tank and dike wall)<br><br>Subsurface samples ( two samples collected from each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 4 borings for BTEX and Naphthalene ( at SB-1 thru SB-4 as proposed) |
| Area E -- representing spill #930211<br><br>Crude oil<br><br>Tank Area 120-2 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX ( at SB-1 thru SB-10)<br><br>PNAs: 4 composite samples, each of 5 discrete sampling points as indicated in proposal diagram.<br><br>Subsurface samples (one sample each boring at highest PID reading )<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram) |
| Area F -- representing spills #942288, #941873, #942855, and #951217<br><br>Crude oil and gasoline<br><br>Tank Area 200-1 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 8 borings (at SB-1 thru SB-8 as indicated in the proposal diagram). |
| Area G -- representing spill #931160<br><br>Sulfuric acid<br><br>Cooling Tower #5 Area | Surface samples (0-12")<br><br>pH: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram). |

| | |
|---|---|
| Area H -- representing spill #941913, #942188<br><br>Gasoil<br><br>Area adjacent to Hawthorn Avenue where feed supply lines cross to connect with Tank 120-7 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (of 5 discrete sampling points each as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram). |
| Area J -- representing spill #942432 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX ( only SB-1 thru SB-4 as indicated in proposal diagram)<br><br>PNAs: 2 composite samples (of 2 discrete sampling points each as indicated in proposal diagram, SB-1 thru SB-4).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 6 borings (at SB-1 thru SB-6 as indicated in the proposal diagram). |

As for Area K (representing spill #940515 (asphalt)) and Area L (representing Spills #941701, #950726 and #950893 (gasoil, fuel oil and petroleum leaching)), the Agency has received and reviewed the "Field Investigation Workplan for Groundwater Sampling at Clark Refining and Marketing, Inc. Black Oil River Line Release area" dated June 1995 pertaining to Area K and the "Site Assessment Report - Hartford River Terminal for Clark Refining and Marketing, Inc. Hartford, Illinois" dated December 1995 pertaining to Area L. Pursuant to Clark's proposed field investigation workplan and site assessment report for sites "K" and "L", the Agency requests that the wells from each of these sites be sampled and monitored for at least three years. The sampling and monitoring frequency for the first year shall be on a quarterly basis, the second year on a semi-annual basis, and annually thereafter. Sampling shall continue until three consecutive sets of sample data show levels below groundwater quality standards or groundwater cleanup objectives approved by the Agency. The sample parameters proposed by Clark's consultant are acceptable.

In addition, soil boring and sampling results from Area L taken from the December 1995 site assessment report have indicated that volatile samples from selected soil borings are in excess of the TACO Class I soil cleanup objectives. Clark shall provide the Agency with a workplan to address these soils at Area L (River Terminal Location).

The agreed schedule is that Clark shall send final plans for Agency approval two weeks after receipt of this letter. The Agency shall in one week following its receipt of the plans. The plans should be sent to Jim O'Brien with a copy to me. If you have any questions, please do not hesitate to call.

Very truly yours,

James L Morgan

James L. Morgan
Senior Assistant Attorney General
Environmental Bureau, Springfield

enc.

pc: Jim O'Brien

John Waligore

JLM:jm

1190500002
Clark Oil
SF/Tech

CLARK

REFINING & MARKETING, INC.

201 East Hawthorne
Hartford, Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

Source: IEPA BOL

April 7, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Division of Environmental Programs
Illinois Environmental Protection Agency
2200 Churchill Road, P.O. Box 19276
Springfield, IL 62794

Re: State vs. Clark, PCB 95-163

Dear Mr. O'Brien,

Please find attached a copy of the Burns & McDonnell Waste Consultants, Inc. report entitled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery dated April 1997. This report summarizes the field sampling activities and analytical results for Areas A through H, and Area J at the Clark Hartford Refinery. Field activities were conducted in accordance with the sampling and analysis plans approved by the Illinois EPA.

The preliminary findings show that Clark's remediation efforts have been successful. Selected areas may require further evaluation. We believe the remediation goals should take into account the former and future industrial use of the sites and the minimal risk of exposure to the public. If you have any questions, feel free to contact Bill Irwin at (618) 254-7301 ext. 266.

Sincerely,

Forrest B. Lauher
Refinery Manager

Enclosure

cc: John Sherrill
Tom Powell
Tom Miller

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IEPA/DLPC

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Sorrce: IEPA BOL

# SUMMARY REPORT: SURFACE AND SUBSURFACE INVESTIGATIONS OF SPILLS AT THE CLARK HARTFORD REFINERY FOR CLARK REFINING AND MARKETING, INC. HARTFORD REFINERY HARTFORD, ILLINOIS

SEPTEMBER 1996

**Project No. 94-155-4-056**



**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

# TABLE OF CONTENTS

# INTRODUCTION

This report presents the results of nine separate surface and subsurface investigations associated with reported spills at the Clark Refining and Marketing, Inc.'s (Clark) Hartford, Illinois Refinery. These spills occurred between December 6, 1991 and July 7, 1995 at or near the Hartford Refinery. Clark's Hartford Refinery is located in Hartford, Illinois, approximately 10 miles north of St. Louis, Missouri.

The site investigation reports included herein present data obtained as a result of soil sample collection and analysis conducted as part of Clark's efforts to investigate areas impacted by these documented releases. Soil sampling and analysis at each site was conducted according to the site specific Sampling and Analysis Plan generated by Burns & McDonnell Waste Consultants, Inc. (BMWCI) and approved by the Illinois Environmental Protection Agency. BMWCI personnel provided oversight of all field activities described in the following reports.

SITE INVESTIGATION REPORT
FOR
AREA D
TANK 10-5 SPILL AREA
ILLINOIS EPA SPILL NO. 941526
CLARK REFINING AND MARKETING, INC.
HARTFORD, ILLINOIS

AUGUST 1996

**94-155-4-056**

**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

## TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 GENERAL

The following describes the site investigation activities used to further characterize the condition of the Tank 10-5 diked area (Site) for Clark Refining & Marketing, Inc. (Clark) in Hartford, Illinois. The results of this characterization were used, in addition to previous surface sampling conducted in October, 1995, to determine the approximate vertical and horizontal extent of subsurface contamination at the Site due to this release (Illinois Environmental Protection Agency Spill #941526). This site investigation report provides: site geology and hydrology, a description of the field work performed; methods, procedures, and analyses used; chemical analytical data; and a summary of contaminant occurance. The location of the Site is illustrated on Figure 1.

## 1.2 SITE HISTORY AND DESCRIPTION

On July 9, 1994, Clark had a release of approximately 308 barrels of naphtha and toluene into the Tank 10-5 diked area. All the material was contained within the confines of the secondary containment dike. The area around Hartford and the refinery had experienced heavy rain prior to the release, thus the diked area surrounding Tank 10-5 was full of water. Clark personnel used vacuum trucks to recover the product and rain water from the diked area. When the levels of water began to diminish, Clark personnel added additional water to the diked area to insure that the material which had been spilled remained floating on the top of the water and could only minimally contact soil in the area. Clark estimates approximately 307 barrels of the product and 680 barrels of water were recovered. Recovered product was rerun through the process units, while the recovered water was treated in the aggressive biological wastewater treatment process.

Following recovery of the product, Clark initiated a modified biological augmentation program to remediate the soil surrounding Tank 10-5 by applying activated sludge from the aggressive biological wastewater treatment process to the soil. Clark collected a composite soil sample from the impacted area on June 5, 1995. Grab soil samples were also collected on August 1, 1995 from the same locations as the previous composite sample.

On June 28, 1995, Clark began excavating soil surrounding Tank 10-5. Between June 28 and June 30, 1995, four roll off containers were loaded with soil from this area. Approximately 50 cubic yards of soil was disposed of at Laidlaw Landfill in Roxana, Illinois. Clark resampled the area on October 12, 1995 by collecting grab soil samples from the locations previously sampled for the composite. Soil samples were analyzed for BTEX and PNAs. A more detailed description of the previous sampling activities and the laboratory results is contained in the Burns & McDonnell Waste Consultants, Inc. (BMWCI) report Summary Report of Spills at the Clark Hartford Refinery for Clark Refining and Marketing, Inc. of November 1995. The Site is depicted in Figure 2.

* * * * *

# 2.0 HYDROGEOLOGY

## 2.1 REGIONAL HYDROGEOLOGY

The Site lies within the Alluvial Valleys Region as defined in United States Geological Survey Water-Supply Paper 2242, 1984. The Alluvial Valleys Region is commonly underlain by sand and gravel as well as silt and clay. The surficial deposit of sand and gravel is commonly underlain by interbedded silt and clay in turn underlain by a basal layer of sand and gravel. Locally, these units are collectively known as Cahokia Alluvium. The subsurface material in the Site area consists of Quarternary Alluvium, which is made up of modern river floodplain deposits of poorly-sorted sands, silts, and clays with some sandy gravel. The alluvium ranges in thickness from 50 to 200 feet below the ground surface (bgs).

The sequence of deposits in the Alluvial Valleys Region is dependant on the depositional history. The sands and gravels in the valleys of major streams, such as the Mississippi River, are commonly overlain by deposits of clay and other fine-grained alluvium deposited during floods following the end of the glacial period.

The alluvial deposits are recharged by precipitation on the valleys, groundwater moving from the adjacent and underlying aquifers, and overbank flooding of the streams. Water in the alluvial deposits discharges to the streams in the valleys.

The underlying bedrock in the Hartford area is composed of Mississippian age interbedded limestones, sandstones, and shales of the Lower Chesterian Series. Regionally, these units dip east toward the center of the Illinois Basin. The Illinois Basin is the major geologic structure in the region.

## 2.2 LOCAL HYDROGEOLOGY

Soil borings were completed to a maximum of 7 feet below ground surface (bgs) at this location. Sediments encountered during drilling included mainly greenish to dark grey silty clays with some shallow, gravelly topsoil. Groundwater was not encountered during drilling. Soil boring logs are included as Appendix A.

* * * * *

## 3.0 FIELD INVESTIGATION ACTIVITIES

To determine the approximate vertical and horizontal extent of petroleum hydrocarbons at the Site, four surface soil samples were collected and four soil borings were drilled and sampled. The sampling locations were concentrated around Tank 10-5 and are shown on Figure 2.

### 3.1 SURFACE SOIL SAMPLE COLLECTION

To determine the presence of surface contaminants in the vicinity of the release, four surface soil samples were collected and analyzed for naphthalene and benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (EPA) Method 8020. Surface soil samples were collected at a depth of 6 inches below ground surface to insure sampling of native soil. Soil samples were placed in laboratory-cleansed jars after collection.

### 3.2 DRILLING AND SUBSURFACE SOIL SAMPLE COLLECTION

Four soil borings were drilled in the vicinities of Tank 10-5. The first 2.5 feet of each boring was field screened with a photoionization detector (PID). Each boring was completed to a depth of 5 feet below the highest PID reading, as measured in the top 2.5 feet. Soil borings were drilled using an all terrain vehicle (ATV) mounted drill rig with hollow stem augers and were continuously sampled using split spoon samplers. Drilling logs are included in Appendix A.

Subsurface soil samples were collected from the location of the highest PID reading and from the bottom of the boring. Soil samples were removed from the samplers with minimal disturbance and placed in laboratory-cleansed jars.

### 3.3 SAMPLE COLLECTION PROTOCOL

Personnel responsible for activities associated with collection of soil samples followed standard procedures to reduce the possibility of contamination and cross-contamination of the samples prior to delivery to the laboratory. Clean, decontaminated sampling equipment was used at each sampling location. Soil samples were placed in a cooler with ice and promptly delivered to the analytical laboratory using chain-of-custody procedures. All laboratory analyses were performed in accordance with EPA methodology by American Technical and Analytical Services, Inc., of Maryland Heights, Missouri. The laboratory results and chain-of-custody forms for surface soil samples are included in Appendix B.

* * * * *

## 4.0 CONTAMINANT OCCURRENCE

Four surface and four subsurface soil samples were collected and submitted for laboratory chemical analysis to delineate the approximate horizontal and vertical extent of soil impacted by petroleum hydrocarbons at the site. The analytical laboratory reports are contained in Appendix B.

### 4.1 SURFACE SOIL SAMPLES

Of the four surface soil samples analyzed for BTEX constituents, two exceed the Illinois EPA Tiered Approach to Cleanup Objectives (TACO) Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties. Soil samples S-2 and S-4 exceed the TACO Tier 1 values for benzene only. All four surface soil samples are below the TACO Tier 1 values for naphthalene. The results of surface soil sample analyses are summarized in Table 1.

### 4.2 SUBSURFACE SOIL SAMPLES

Eight subsurface soil samples were collected from four soil borings and submitted for laboratory analysis of BTEX and naphthalene by EPA Method 8020. All four soil borings exceed TACO Tier 1 values for benzene. All subsurface soil samples are below the TACO Tier 1 values for the remaining BTEX constituents and naphthalene. The results of subsurface soil sample analyses are summarized in Table 2.

* * * * *

## 5.0 CONCLUSIONS

- No free petroleum product was encountered during soil sampling.

- No surface or subsurface soil samples exceed TACO Tier 1 values for naphthalene or toluene. These compounds would representative of the released material, naphtha and toluene.

* * * * *

# TABLE 1
## Summary of Surface Analytical Results
## Clark Refining & Marketing, Inc.
## Area D, Tank 10-5 Tank Yard
## Hartford, Illinois

| Sample Number: | | TACO | S-1 | | S-2 | | S-3 | | S-4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | |
| COMPOUND | | | | | | | | | | |
| BTEX | | | RL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 1 | 7 | 125 | 270* | 1 | 1 | 125 | 3,100* |
| Toluene | µg/Kg | 5,000 | 1 | BDL | 125 | 140 | 1 | BDL | 125 | 970 |
| Ethylbenzene | µg/Kg | 5,000 | 1 | BDL | 125 | 190 | 1 | BDL | 125 | 2,400 |
| Xylenes (total) | µg/Kg | 74,000 | 1 | BDL | 125 | 1,200 | 1 | BDL | 1250 | 4,400 |
| Total BTEX | µg/Kg | | | 7 | | 1,800 | | 1 | | 10,870 |
| Naphthalene | µg/Kg | 30,000 | 1 | 2 | 125 | 2,500 | 1 | 12 | 125 | 5,100 |

[1] - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

DL - Detection Limit

µg/Kg - Microgram per kilogram

BDL - Below detection limit

NL - Compound not listed in TACO Tier 1, Table B

486* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwater)

# TABLE 2
## Summary of Subsurface Analytical Results
## Clark Refining & Marketing, Inc.
## Area D, Tank 10-5 Tank Yard
## Hartford, Illinois

| Sample Number: | | TACO | SB-1-2 | | SB-1-7 | | SB-2-1 | | SB-2-6 | | SB-3-1 | | SB-3-6 | | SB-4-2 | | SB-4-7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | |
| COMPOUND | | | | | | | | | | | | | | | | | | |
| BTEX | | | RL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 5 | 160* | 125 | 4000* | 10 | 240* | 125 | 870* | 125 | 130* | 125 | 210* | 5 | 110* | 1,250 | 2500* |
| Toluene | µg/Kg | 5,000 | 5 | 41 | 125 | 920 | 10 | 36 | 125 | 220 | 125 | BDL | 125 | BDL | 5 | 39 | 1,250 | 1,800 |
| Ethylbenzene | µg/Kg | 5,000 | 125 | 140 | 125 | 2,100 | 10 | 29 | 125 | BDL | 125 | 140 | 125 | 580 | 5 | 55 | 1,250 | BDL |
| Xylenes (total) | µg/Kg | 74,000 | 125 | 310 | 125 | 2,500 | 10 | 66 | 125 | 520 | 125 | 250 | 125 | 750 | 5 | 170 | 1,250 | 6,200 |
| Total BTEX | µg/Kg | | | 651 | | 9,520 | | 371 | | 1,610 | | 520 | | 1,540 | | 374 | | 10,500 |
| | | | | | | | | | | | | | | | | | | |
| Naphthalene | µg/Kg | 30,000 | 125 | 300 | 1250 | 14,000 | 10 | 170 | 125 | 3,200 | 125 | 2900 | 125 | 2100 | 5 | 270 | 1250 | 9500 |

[1] - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

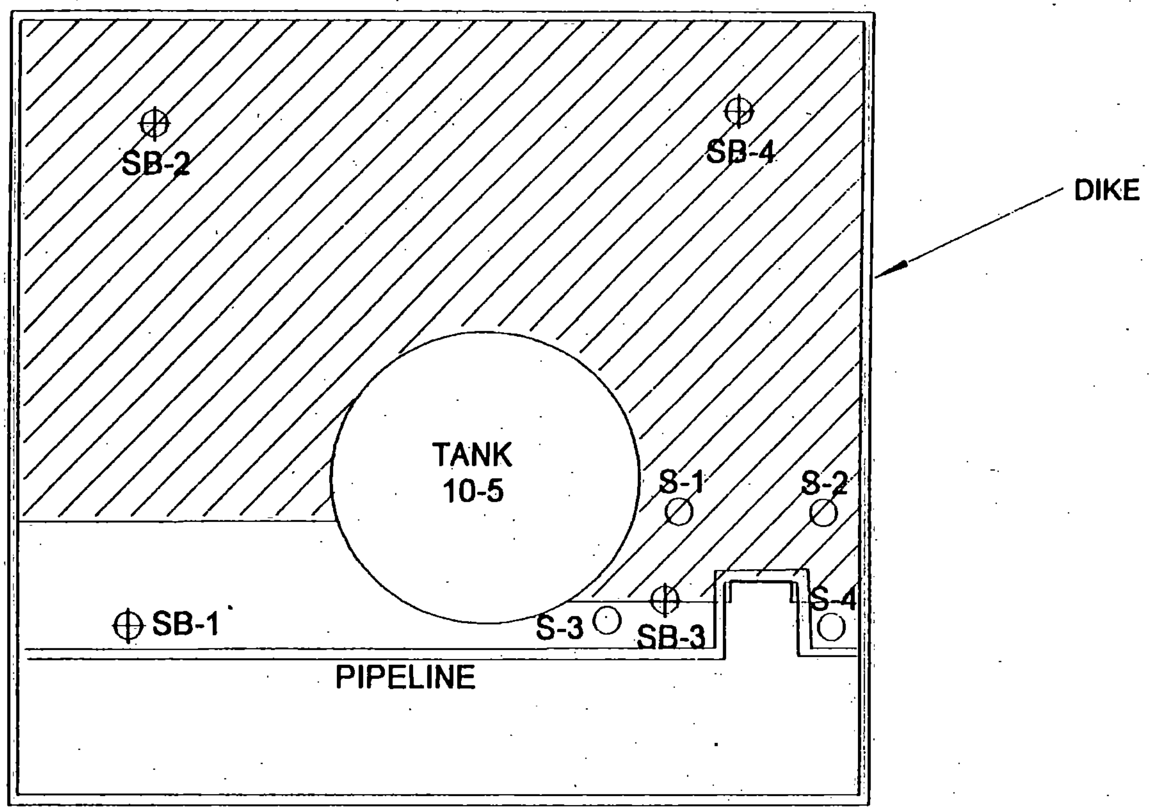
DL - Detection Limit

µg/Kg - Microgram per kilogram

BDL - Below detection limit

NL - Compound not listed in TACO Tier 1, Table B

488* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwater)




20 0 20 40
SCALE IN FEET

LEGEND

- EXCAVATED AREA (1' DEPTH)

SB-3 - SOIL BORING LOCATION

S-1 - SURFACE BTEX SOIL SOIL SAMPLE LOCATION

Burns & McDonnell Waste Consultants, Inc.

FIGURE 2

Soil Sampling Locations
Tank 10-5 Yard

Release #941526

Clark Refining & Marketing, Inc.

FILE

FILE NUMBER 070.20.01.08 080.58.47

# CLARK

RETAIN IN FILE UNTIL ______

201 East Hawthorne
Hartford Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

November 10, 1997

Mr. Jim O'Brien, Manager
Office of Chemical Safety
Illinois Environmental Protection Agency
P.O. Box 19726
Springfield, IL 62794-9726

Re: Tiered Approach Objective Assessment

Dear Mr. O'Brien,

Enclosed is a copy of the Tiered Approach Objective assessment for the spill sites at the Hartford Refinery that was prepared by Burns & McDonnell. Clark Refining and Marketing, Inc. will provide your department with remediation techniques for two of the remaining sites in the near future.

Please call me at 618-254-7301, extension 218 with your questions.

Sincerely,

M. Modarres

Massood Modarres
Environmental Engineer

cc: John Sherrill
Tom Miller
File ✓

Burns & McDonnell Waste Consultants, Inc.

November 3, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery: IEPA Spill Nos. 940851, 941772, 942837, 941526, 930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this Tiered Approach to Cleanup Objectives (TACO) assessment of the above-listed spill sites at the Clark Hartford Refinery. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. In this letter report, the data compiled in the September 1996 report for each spill site is evaluated for compliance with TACO Tier I and Tier II cleanup objectives.

## SOIL SAMPLES

Soil sample analytical data for surface and subsurface samples is summarized in Tables 1 and 2, respectively. Tables 1 and 2 are condensed from the September 1996 report and list only the contaminants detected at each spill site in excess of TACO Tier I Cleanup Objectives for Industrial/Commercial properties. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. Spill areas are shown on a map of the refinery, included as Figure 1. Samples from areas that are not listed in the tables were all below the Industrial/Commercial cleanup objectives. TACO Tier 1 Exposure-Route Specific Values for Soils are summarized for the contaminants of concern in Table 3 for the Industrial/Commercial, Construction Worker, and Migration to Groundwater scenarios.

In addition to the soil sampling completed for the September 1996 report, soil samples were collected September 23, 1997 from four areas for analysis of organic carbon. Soil samples were collected from two locations each in Areas B, C, H, and J, and analyzed for

17 Cassens Court
Fenton, Missouri 63026

Phone: 314 305-0077
Fax: 314 326-8295
http://www.burnsmcd.com

Organic Matter using ASTM D2974-87 and for Total Organic Carbon using EPA SW-846. The samples were collected from below the contaminated zone at depths ranging from 7 to 12 feet below ground surface. Analytical data is presented in Table 4. Although both methods are approved for determination of the fraction of organic carbon ($f_{oc}$), the site-specific $f_{oc}$ values used for this assessment were calculated from the ASTM method of analyzing for organic matter. These values are also presented in Table 4.

**TIER II CLEANUP OBJECTIVES**

The site-specific $f_{oc}$ was evaluated for Areas B, C, H, and J so that site-specific cleanup objectives could be calculated for the Migration to Groundwater pathway. The TACO Tier I cleanup objectives given in TACO Appendix B, Table A for the Migration to Groundwater pathway are calculated for subsurface soil samples with a default $f_{oc}$ value of 0.002 gm/gm. Table 5 presents the site-specific cleanup objectives for the Migration to Groundwater pathway in addition to the surface and subsurface soil default objectives. The site-specific cleanup objectives were calculated using Equation S17 in TACO Appendix C, Table A. Default values for clay soil were used for density and porosity values.

To use calculated site-specific cleanup objectives, TACO specifies three additional concentration limits that cannot be exceeded for a site:

- the soil saturation limit for each chemical (calculated according to Section 742.220) cannot be exceeded,

- the soil attenuation capacity for each site (calculated according to Section 742.215) cannot be exceeded, and

- a weighted average of 1 (calculated according to Section 742.720) cannot be exceeded at each site for chemicals that target the same organ.

According to TACO Table E in Appendix A, the contaminants of concern to this study that target the same organ include only toluene and ethylbenzene, which both target the kidneys. These contaminants are present together above TACO Tier 1 Industrial/Commercial cleanup objectives for Area B only. Of the 8 samples listed in Table 1, the weighted average exceeds 1 for samples S-1 and S-13.

The soil attenuation capacity is represented by the organic carbon concentration in the soil at each site. The total concentration of all organic contaminants of concern at a site is

compared to the total organic material in the soil at that site. The total organic contaminant concentrations for all areas discussed in this assessment fall below the default organic matter concentration of 2000 milligrams per kilogram (mg/kg). (Please refer to the September 1996 report for complete soil analytical data.)

Soil saturation limits for benzene, toluene, ethylbenzene, and xylenes (BTEX) are given in TACO Appendix A, Table A. As indicated in the footnotes of Table 5, soil saturation limits are used as cleanup objectives when calculated objectives exceed the saturation limits.

**TIER II ASSESSMENTS**

In the following pages, each area is individually evaluated relative to the calculated TACO Tier II cleanup objectives presented in Table 5. All of the areas discussed in this assessment are areas that do not support full-time workers or structures. Clark personnel are present in the areas only intermittently and these areas are not generally accessible to the public. It is therefore reasonable at each of these sites that the construction worker scenario be used for the ingestion and inhalation cleanup objectives.

Each of the assessment pages in Attachment A addresses the status of a single area. The contaminants of concern (COCs) in both surface and subsurface soil are represented by the highest concentration for each in that area (refer to Tables 1 and 2 for complete soil sample information). In cases were detection limits exceed the cleanup objectives, non-detect samples are considered to be in excess of the cleanup objectives. The limiting scenario(s) for each area are determined by selecting the most conservative cleanup objectives from Table 5. The Tier II assessment for each area is then a direct comparison of the site data with the most conservative site-specific cleanup objectives.

**SUMMARY**

TACO assessment of each of the areas at the Clark Refinery, as shown in Attachment A, indicates that Areas A, E, F, G, and H are all below TACO Tier II cleanup objectives for the applicable contaminant pathway scenarios. These areas do not require further assessment or remediation.

Area B, surrounding Tank 35-2 in the tank yard, has surface and subsurface concentrations of BTEX constituents that exceed the TACO Tier II cleanup objectives. The cleanup objectives for this area include the calculated site-specific concentration for benzene (migration to groundwater pathway), and the construction worker scenario concentrations for TEX.

Area C, surrounding Tank 55-1 in the tank yard, has subsurface soil concentrations of benzene in two samples that exceed the Tier II cleanup objectives. The benzene cleanup objective for this area is a calculated site-specific concentration for the migration to groundwater pathway.

Area D, surrounding Tank 10-5 in the tank yard, has surface and subsurface soil concentrations of benzene that exceed Tier II cleanup objectives. The benzene cleanup objectives for this area are the generic TACO Tier I values, migration to groundwater pathway, for surface and subsurface soil.

Area J, along Illinois Route 3, has two subsurface soil samples in excess of the Tier II cleanup objectives for benzene, and one subsurface soil sample in excess of the Tier II cleanup objectives for benzo(b)fluoranthene and dibenzo(a,h)anthracene. The cleanup objectives for this area are calculated site-specific concentrations, migration to groundwater pathway, for these three contaminants.

If you have any questions concerning this assessment, please contact me at (314) 305-0077, ext. 226.

Sincerely,

Paul Christian

Paul Christian
Project Manager

attachment

# Table 1
## Tier II Surface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area A | | Area B | | | | | | | | Area C | Area D | | Area E | Area J | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S-5 | S-6 | S-1 | S-3 | S-6 | S-8 | S-9 | S-10 | S-13 | S-14 | S-8 | S-2 | S-4 | S-13 | SB-5S | SB-6S |
| Benzene | -- | -- | 6.6 | 3.9 | 0.036 | 2.4 | 12 | 0.26 | 53 | 0.1 | -- | 0.27 | 3.1 | -- | -- | -- |
| Toluene | -- | -- | 69 | -- | -- | -- | 53 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | 36 | -- | -- | -- | 19 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | >75 | 110 | -- | 90 | >75 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | 1.21 | 0.851 | -- | -- | -- | -- | -- | -- | -- | -- | 2.90 | -- | -- | 1.25 | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | 1.03 | 2.25 | -- | -- | -- | -- | -- | -- | -- | -- | 4.28 | -- | -- | -- | 2.10 | 1.16 |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 2
## Tier II Subsurface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area B | | | | | | | | | Area C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-1 | SB1-5 | SB2-2 | SB3-2 | SB3-7 | SB4-2 | SB4-7 | SB5-5 | SB7-5 | SB1-2 | SB1-7 | SB3-2.5 | SB3-7.5 |
| Benzene | 3.2 | <1.25 | <1.25 | 2.7 | 0.33 | <1.25 | 0.052 | <0.125 | 0.38 | 0.17 | -- | 0.27 | 1.5 |
| Toluene | 15 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | 16 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | >75 | -- | -- | >75 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.071 | -- | -- |

| | Area D | | | | | | | | Area H | Area J | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-2 | SB1-7 | SB2-1 | SB2-6 | SB3-1 | SB3-6 | SB4-2 | SB4-7 | SB1-2 | SB1-8 | SB1-13 | SB3-8 | SB3-13 |
| Benzene | 0.16 | 4 | 0.24 | 0.87 | 0.13 | 0.21 | 0.11 | 2.5 | 0.059 | 0.034 | -- | <0.125 | 0.2 |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.94 | -- | 4.09 | 3.93 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 23.30 | -- | -- | 5.65 |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.9 | 1.28 | 1.92 | 1.78 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 238 | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 18.2 | 2.37 | 3.97 | 3.08 |

* All sample data reported in milligrams per kilogram (mg/kg)

## Table 3
## Exposure-Route Specific Values for Soils
## Illinois Tiered Approach to Cleanup Objectives

| | Industrial/Commercial | | Construction Worker | | Migration to Groundwater |
|---|---|---|---|---|---|
| | Ingestion | Inhalation | Ingestion | Inhalation | |
| Benzene | 200 | 1.5 | 4,300 | 2.1 | 0.03 |
| Toluene | 410,000 | 650 | 410,000 | 42 | 12 |
| Ethylbenzene | 200,000 | 400 | 20,000 | 58 | 13 |
| Xylenes | 1,000,000 | 410 | 410,000 | 410 | 150 |
| Benzo(a)anthracene | 8 | – | 170 | – | 2 |
| Benzo(b)fluoranthene | 8 | – | 170 | – | 5 |
| Benzo(a)pyrene | 0.8 | – | 17 | – | 8 |
| Chrysene | 780 | – | 17,000 | – | 160 |
| Dibenzo(a,h)anthracene | 0.8 | – | 17 | – | 2 |

* All sample data reported in milligrams per kilogram (mg/kg)

**All information reproduced from Title 35, Subtitle G, Chapter I, Subchapter f, Part 742, Appendix B, Table B

# Table 4
## Summary of Fraction Organic Carbon Analysis
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| Sample Location & Number | Sample Date | Organic Matter ASTM D2974-87 | Tot. Organic Carbon EPA SW-846 | Average Fraction Organic Carbon[1] |
|---|---|---|---|---|
| Area B - 1 | 09/23/97 | 15,000 | 830 | |
| Area B - 2 | 09/23/97 | 13,900 | 5952 | 0.0145 |
| Area C - 1 | 09/23/97 | 10,800 | 5353 | |
| Area C - 2 | 09/23/97 | 14,800 | 1107 | 0.0128 |
| Area H - 1 | 09/23/97 | 14,600 | 2288 | |
| Area H - 2 | 09/23/97 | 2,570 | 5371 | 0.0089 |
| Area J -1 | 09/23/97 | 7,800 | 2578 | |
| Area J - 2 | 09/23/97 | 2,300 | 2411 | 0.0051 |

* All sample data reported in milligrams per kilogram (mg/kg)

[1] = Average is calculated using ASTM Method data only.

# Table 5
## Tier II Cleanup Objectives - Soil
## Industrial/Residential Scenario
## Migration to Groundwater Pathway
## Illinois Tiered Approach to Cleanup Objectives

| | TACO Generic Cleanup Objectives | | Site Specific Cleanup Objectives | | | |
|---|---|---|---|---|---|---|
| | Surface | Subsurface | Area B | Area C | Area H | Area J |
| | (foc =0.006) | (foc = 0.002) | (foc = 0.015) | (foc = 0.013) | (foc = 0.009) | (foc = 0.005) |
| Benzene | 0.09 | 0.03 | 0.225 | 0.195 | 0.135 | 0.075 |
| Toluene | 36 | 12 | 90 | 78 | 54 | 30 |
| Ethylbenzene | 39 | 13 | 97.5 | 84.5 | 58.5 | 32.5 |
| Xylenes | 410** | 150 | 410** | 410** | 410** | 375 |
| Benzo(a)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |
| Benzo(b)fluoranthene | 15 | 5 | 37.5 | 32.5 | 22.5 | 12.5 |
| Benzo(a)pyrene | 24 | 8 | 60 | 52 | 36 | 20 |
| Chrysene | 480 | 160 | 1,200 | 1,040 | 720 | 400 |
| Dibenzo(a,h)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |

* All sample data reported in milligrams per kilogram (mg/kg)

** Cleanup Objective calculations are limited by the soil saturation concentration (410 mg/kg)

ATTACHMENT A

TACO Tier II Assessment Sheets

| | | |
|---|---|---|
| LOCATION: | Area A - NW of Biological Treatment Unit | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 1.21 mg/kg |
| | Dibenzo(a,h)anthracene | 2.25 mg/kg |
| COCs - SUBSURFACE: | N/A | |
| LIMITING SCENARIO: | Migration to Groundwater (generic surface): | |
| | Benzo(a)pyrene | 24 mg/kg |
| | Dibenzo(a,h)anthracene | 6 mg/kg |

TIER II ASSESSMENT:

Surface soil concentrations of both benzo(a)pyrene and dibenzo(a,h)anthracene are below the cleanup objectives for both the construction worker scenario and the migration to groundwater scenario.

| | | |
|---|---|---|
| LOCATION: | Area B - Tank 35-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial Commercial with no full time workers and no structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 53 mg/kg |
| | Toluene | >75 mg/kg |
| | Ethylbenzene | >75 mg/kg |
| | Xylenes | >75 mg/kg |
| COCs - SUBSURFACE: | Benzene | 3.2 mg/kg |
| | Toluene | 15 mg/kg |
| | Ethylbenzene | 16 mg/kg |
| | Xylenes | >75 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.225 mg/kg |
| | Construction Worker: | |
| | Toluene | 47 mg/kg |
| | Ethylbenzene | 58 mg/kg |
| | Xylenes | 410 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-1, S-3, S-8, S-9, S-10, and S-13 are in excess of the limiting scenario cleanup objective for benzene; surface soil samples S-1, S-9, and S-13 exceed the objective for toluene; surface soil sample S-13 exceeds the ethylbenzene objective, and surface soil samples S-1, S-9, and S-13 exceed the xylenes cleanup objective. In addition, the weighted average of toluene and ethylbenzene concentrations exceed 1 for soil samples S-1 and S-13.

Subsurface soil samples SB1-1, SB1-5, SB2-2, SB3-2, SB3-7, SB4-2, and SB7-5 are in excess of limiting scenario cleanup objectives for benzene. Subusurface soil samples SB1-1 and SB3-2 are potentially in excess of the cleanup objective for xylenes.

| | | |
|---|---|---|
| LOCATION: | Area C - Tank 55-1 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full-time workers or [illegible] structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 2.90 mg/kg |
| | Dibenzo(a,h)anthracene | 4.28 mg/kg |
| COCs - SUBSURFACE: | Benzene | 1.5 mg/kg |
| | Dibenzo(a,h)anthracene | 0.971 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.195 mg/kg |
| | Dibenzo(a,h)anthracene | 13 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below cleanup objectives for both the construction worker scenario (Table 3) and the site-specific migration to groundwater scenario (Table 5).

Subsurface soil samples SB3-2.5 and SB3-7.5 are in excess of the migration to groundwater scenario benzene cleanup objective. All subsurface soil samples are below cleanup objectives for dibenzo(a,h)anthracene.

| | | |
|---|---|---|
| LOCATION: | Area D - Tank 10-5 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | ~~Industrial/Commercial with no full-time workers and no~~ structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 3.1 mg/kg |
| COCs - SUBSURFACE: | Benzene | 4.0 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (generic):<br>Benzene (surface) 0.09 mg/kg<br>Benzene (subsurface) 0.03 mg/kg | |

TIER II ASSESSMENT:

Surface soil samples S-2 and S-4 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

Subsurface soil samples SB1-2, SB1-7, SB2-1, SB2-6, SB3-1, SB3-6, SB4-2, and SB4-7 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

| | | |
|---|---|---|
| LOCATION: | Area E - Tank 120-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 1.25 mg/kg |
| COCs - SUBSURFACE: | NA | |
| LIMITING SCENARIO: | Construction Worker:<br>Benzo(a)pyrene | <br>17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario for benzo(a)pyrene.

All subsurface soil samples are below all cleanup objectives for both the construction worker and migration to groundwater scenarios.

LOCATION: Area F - Tank 200-1

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

All surface and subsurface soil samples are below all applicable cleanup objectives.

LOCATION: Area G - Sulfuric Acid Spill Area

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

Surface soil samples were analyzed for pH and found to be within the normal limits for soil acidity.

LOCATION: Area H - Hawthorne

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario.

COCs - SURFACE: NA

COCs - SUBSURFACE: Benzene 0.059 mg/kg

LIMITING SCENARIO: Migration to Groundwater (site-specific):
Benzene 0.135 mg/kg

TIER II ASSESSMENT:

All surface soil samples are below all applicable TACO Tier I cleanup objectives.

All subsurface soil samples are below the site-specific migration to groundwater cleanup objective calculated for benzene.

| | | |
|---|---|---|
| LOCATION: | Area J - Route 3 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Dibenzo(a,h)anthracene | 2.10 mg/kg |
| COCs - SUBSURFACE: | Benzene | 0.20 mg/kg |
| | Benzo(a)anthracene | 4.94 mg/kg |
| | Benzo(b)fluoranthene | 23.3 mg/kg |
| | Benzo(a)pyrene | 9.9 mg/kg |
| | Chrysene | 238 mg/kg |
| | Dibenzo(a,h)anthracene | 18.2 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.075 mg/kg |
| | Benzo(a)anthracene | 5 mg/kg |
| | Benzo(b)fluoranthene | 12.5 mg/kg |
| | Chrysene | 400 mg/kg |
| | Dibenzo(a,h)anthracene | 5 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario and the site-specific migration to groundwater scenario.

Subsurface soil samples SB3-8 and SB3-13 are in excess of the site-specific migration to groundwater cleanup objectives for benzene. Subsurface soil sample SB1-8 is in excess of the migration to groundwater cleanup objectives for both benzo(b)fluoranthene and dibenzo(a,h)anthracene.

FILE NUMBER 070.05 SPILLS-RIVERS (Burns - ...)

FILE UNTIL

Burns & McDonnell | Waste Consultants, Inc.

November 20, 1997

Old Refinery
Historic Contamination

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery:
IEPA Spill Nos. 940851, 941772, 942837, 941526,
930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this proposal for remediation activities at the Clark Refinery Spill Sites listed above. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. A Tiered Approach to Cleanup Objectives (TACO) Tier II assessment of each area was also completed by BMWCI and summarized in the November 3, 1997 BMWCI letter to the Illinois Environmental Protection Agency (IEPA). In the November 3, 1997 letter, Areas A, E, F, G, and H were all determined to be below Tier II cleanup objectives, making remediation of these areas unnecessary. This letter, on the basis of the TACO Tier II assessment, presents Clark's proposed remedial approaches for each of the remaining spill areas (Areas B, C, D, and J).

A ⇒ asphalt
E ⇒ Crude
F ⇒ Crude & gasoil
G ⇒ $H_2SO_4$
H ⇒ gasoil

B Bioremediation

As detailed in the November 3, 1997 letter, Area B (gasoline) has surface and subsurface soil samples in excess of TACO Tier II cleanup objectives (CUOs) for benzene, toluene, ethylbenzene, and xylenes (BTEX). Of the 7 subsurface soil samples in excess of Tier II CUOs, 4 are located within the top 2 feet of the surface, including the 2 samples with the highest benzene concentrations. As the majority of the contamination is shallow (less than 2 feet below ground surface), proposed remediation efforts at this area include surface application of heterotrophic bacteria and soil aeration through disking. Therefore, remediation efforts will be concentrated on the top 2 feet of soil in this area.

17 Cossens Court
Fenton, Missouri 63026

Phone: 314 305-0077
Fax: 314 326-8295

gasoil

Area C, as detailed in the November 3, 1997 letter, has only two samples in excess of Tier II CUOs for benzene. Both of the subsurface soil samples were collected from soil boring SB-3 at depths of 2.5 and 7.5 feet bgs; indicating localized historical contamination. As these benzene concentrations do not appear to be related to the spill event of interest in this report, additional remediation activities are not proposed for Area C.

Naphtha & Toluene

A TACO Tier II assessment of Area D was not possible due to difficulty in collecting a site-specific sample for organic carbon analysis. Area D is within the tank farm and is directly across an access road from Area C. Assuming that the fraction of organic carbon in the two areas is comparable, and thereby applying the site-specific CUOs from Area C to Area D, three shallow subsurface soil samples fall below site-specific CUOs. Thus there are two surface and five subsurface soil samples in excess of Tier II CUOs for benzene. The majority of the contamination above Tier II CUOs is subsurface and historical in nature. As these benzene concentrations are not related to the spill event of interest in this report, additional remediation activities are not proposed for Area D.

#2 fuel oil

Area J is along the Route 3 levee in Hartford, Illinois and is under the jurisdiction of both the Wood River Levee District and the Army Corps of Engineers. Access to this area is highly limited by both bureaucratic and physical obstacles. The spill area is only intermittently accessible to vehicle traffic. In addition, the contamination in this Area in excess of TACO Tier II CUOs is limited to subsurface soil. Therefore, additional remediation activities are not proposed for this spill area.

If you have any questions about the proposed remediation activities presented in this letter, please contact me at (314) 305-0077, ext. 226.

Sincerely,

Paul Christian
Project Manager

Clayton
GROUP SERVICES

# APPENDIX P-6

## AREA B TANK 35-2 SPILL AREA
## IEMA INCIDENT 941772

# OFFICE OF THE ATTORNEY GENERAL

STATE OF ILLINOIS

March 11, 1996

Jim Ryan
ATTORNEY GENERAL

Pat Sharkey
Mayer, Brown and Platt
190 South LaSalle Street
Chicago, IL 60603-3441

**RE: Clark Hartford / Spill Sampling Plan Revision Approvals**

Dear Ms. Sharkey:

I am writing to confirm the Agency's acceptance of the plan for sampling that was discussed at a meeting held on February 27, 1996 between representatives of the State and Clark. Initially, Burns & McDonnell had prepared a Sampling and Analysis Plan for Areas B, C, D, F, H, and J. In my letter dated January 16, 1996, to you we proposed additional sampling in Areas A, E, and G as well as groundwater sampling in Areas K and L. At the February 27, 1996, meeting, representatives of Clark presented the State with a two page table of proposals for sampling at the various areas in response to the issues raised in my letter. Further discussions at that meeting resulted in an apparent agreement regarding a sampling plan acceptable to all parties. Following are the specifics of that plan as it is understood by the Illinois EPA representatives.

| | |
|---|---|
| Area A -- representing spill #940851<br><br>Asphalt spill<br><br>Northwest of Bio Unit | Surface samples (one foot below post-cleanup fill interface)<br><br><u>VOC: 4 samples for BTEX</u><br><br><u>PNAs: 3 samples for analysis:</u> One from S-1, a composite of S-2 and S-3, and one from S-4. S-1 and S-4 are intended to be collected just outside the previously remediated area to the south and north respectively. |

| | |
|---|---|
| Area B -- representing spill #941772<br><br>Gasoline spill from mixer failure at Tank 35-2<br><br>Tank Area 35-1 & -2 | Surface samples (6" to 12" depth)<br><br>VOC: 7 samples for BTEX (SB-1 thru SB-5 as proposed, and two more north and south of SB-3 in line with SB-2, SB-5 and SB-1, SB-4 respectively)<br><br>Subsurface samples (two samples each, collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 5 borings each for BTEX (at proposed SB-1 thru SB-5) |
| Area B -- representing spill #941772<br><br>Gasoline spill from mixer failure at Tank 35-2 5<br><br>Tank Area 35-3 | Surface samples (6" to 12" depth)<br><br>VOC: 7 samples for BTEX (5 samples in area affected in east ½ of Tank Area and 2 samples from that part not apparently impacted within the tank dike area)<br><br>Subsurface samples (two samples each ,collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 2 borings for BTEX (both in area affected in East ½ of Tank Area) |
| Area B -- representing spill #941772<br><br>Gasoline spill from mixer failure at Tank 35-2<br><br>Tank Area 55-1 | Consolidated with requirements for Area C, since same tank farm affected. |
| Area C -- representing spills #942837 and #941772<br><br>Gasoil overfill of Tank 55-1 and overflow of gasoline spill from drainage from Tank Area mixer failure at Tank 35-2<br><br>Tank Area 55-1 | Surface samples (6" to 12" depth)<br><br>VOC: 7 samples for BTEX (4 at SB-1 thru SB-4 and three others: one located between SB-3 and SB-4, one collected between the pipe rack and tank 55-1 adjacent to the easternmost aspect of that tank, and one collected between SB-1 and SB-2)<br><br>PNAs: 4 composite samples, each of 5 discrete sampling points, as indicated in proposal diagram.<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>BTEX and PNAs: 4 borings (at SB-1 thru SB-4 as indicated in the proposal diagram) |

| | |
|---|---|
| Area D -- representing spill #941526<br><br>Naphtha and toluene<br><br>Tank Area 10-5 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX and Naphthalene (2 at five to ten feet on either side [east & west] of SB-3 and 2 more collected between east-center of tank and dike wall)<br><br>Subsurface samples ( two samples collected from each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 4 borings for BTEX and Naphthalene ( at SB-1 thru SB-4 as proposed) |
| Area E -- representing spill #930211<br><br>Crude oil<br><br>Tank Area 120-2 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX ( at SB-1 thru SB-10)<br><br>PNAs: 4 composite samples, each of 5 discrete sampling points as indicated in proposal diagram.<br><br>Subsurface samples (one sample each boring at highest PID reading )<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram) |
| Area F -- representing spills #942288, #941873, #942855, and #951217<br><br>Crude oil and gasoline<br><br>Tank Area 200-1 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 8 borings (at SB-1 thru SB-8 as indicated in the proposal diagram). |
| Area G -- representing spill #931160<br><br>Sulfuric acid<br><br>Cooling Tower #5 Area | Surface samples (0-12")<br><br>pH: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram). |

| | |
|---|---|
| Area H – representing spill #941913, #942188<br><br>Gasoil<br><br>Area adjacent to Hawthorn Avenue where feed supply lines cross to connect with Tank 120-7 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (of 5 discrete sampling points each as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram). |
| Area J – representing spill #942432 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX ( only SB-1 thru SB-4 as indicated in proposal diagram)<br><br>PNAs: 2 composite samples (of 2 discrete sampling points each as indicated in proposal diagram, SB-1 thru SB-4).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 6 borings (at SB-1 thru SB-6 as indicated in the proposal diagram). |

As for Area K (representing spill #940515 (asphalt)) and Area L (representing Spills #941701, #950726 and #950893 (gasoil, fuel oil and petroleum leaching)), the Agency has received and reviewed the "Field Investigation Workplan for Groundwater Sampling at Clark Refining and Marketing, Inc. Black Oil River Line Release area" dated June 1995 pertaining to Area K and the "Site Assessment Report - Hartford River Terminal for Clark Refining and Marketing, Inc. Hartford, Illinois" dated December 1995 pertaining to Area L. Pursuant to Clark's proposed field investigation workplan and site assessment report for sites "K" and "L", the Agency requests that the wells from each of these sites be sampled and monitored for at least three years. The sampling and monitoring frequency for the first year shall be on a quarterly basis, the second year on a semi-annual basis, and annually thereafter. Sampling shall continue until three consecutive sets of sample data show levels below groundwater quality standards or groundwater cleanup objectives approved by the Agency. The sample parameters proposed by Clark's consultant are acceptable.

In addition, soil boring and sampling results from Area L taken from the December 1995 site assessment report have indicated that volatile samples from selected soil borings are in excess of the TACO Class I soil cleanup objectives. Clark shall provide the Agency with a workplan to address these soils at Area L (River Terminal Location).

The agreed schedule is that Clark shall send final plans for Agency approval two weeks after receipt of this letter. The Agency shall in one week following its receipt of the plans. The plans should be sent to Jim O'Brien with a copy to me. If you have any questions, please do not hesitate to call.

Very truly yours,

James L Morgan

James L. Morgan
Senior Assistant Attorney General
Environmental Bureau, Springfield

enc.

pc: Jim O'Brien

John Waligore

JLM:jm

11905 0008
Clark Oil
SF/Tech


CLARK

REFINING & MARKETING, INC.

201 East Hawthorne
Hartford, Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064


Source: IEPA BOL

April 7, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Division of Environmental Programs
Illinois Environmental Protection Agency
2200 Churchill Road, P.O. Box 19276
Springfield, IL 62794

Re: State vs. Clark, PCB 95-163

Dear Mr. O'Brien,

Please find attached a copy of the Burns & McDonnell Waste Consultants, Inc. report entitled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery dated April 1997. This report summarizes the field sampling activities and analytical results for Areas A through H, and Area J at the Clark Hartford Refinery. Field activities were conducted in accordance with the sampling and analysis plans approved by the Illinois EPA.

The preliminary findings show that Clark's remediation efforts have been successful. Selected areas may require further evaluation. We believe the remediation goals should take into account the former and future industrial use of the sites and the minimal risk of exposure to the public. If you have any questions, feel free to contact Bill Irwin at (618) 254-7301 ext. 266.

Sincerely,

Forrest B. Lauher
Refinery Manager

Enclosure

cc: John Sherrill
Tom Powell
Tom Miller

RECEIVED
APR 9 1997
IEPA/DLPC

SCREENED

Source: IEPA BOL

# SUMMARY REPORT:
# SURFACE AND SUBSURFACE INVESTIGATIONS OF SPILLS AT THE CLARK HARTFORD REFINERY
# FOR
# CLARK REFINING AND MARKETING, INC.
# HARTFORD REFINERY
# HARTFORD, ILLINOIS

SEPTEMBER 1996

**Project No. 94-155-4-056**



**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

TABLE OF CONTENTS

# INTRODUCTION

This report presents the results of nine separate surface and subsurface investigations associated with reported spills at the Clark Refining and Marketing, Inc.'s (Clark) Hartford, Illinois Refinery. These spills occurred between December 6, 1991 and July 7, 1995 at or near the Hartford Refinery. Clark's Hartford Refinery is located in Hartford, Illinois, approximately 10 miles north of St. Louis, Missouri.

The site investigation reports included herein present data obtained as a result of soil sample collection and analysis conducted as part of Clark's efforts to investigate areas impacted by these documented releases. Soil sampling and analysis at each site was conducted according to the site specific Sampling and Analysis Plan generated by Burns & McDonnell Waste Consultants, Inc. (BMWCI) and approved by the Illinois Environmental Protection Agency. BMWCI personnel provided oversight of all field activities described in the following reports.

# SITE INVESTIGATION REPORT
# FOR
# AREA B
# TANK 35-2 SPILL AREA
# ILLINOIS EPA SPILL NO. 941772
# CLARK REFINING AND MARKETING, INC.
# HARTFORD, ILLINOIS

AUGUST 1996

94-155-4-056

Burns & McDonnell Waste Consultants, Inc.
Engineers - Geologists - Scientists
St. Louis, Missouri

TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 GENERAL

The following describes the site investigation activities used to further characterize the condition of the Tank 35-1, 35-2, and 35-3 diked areas (Site) for Clark Refining & Marketing, Inc. (Clark) in Hartford, Illinois. The results of this characterization were used, in addition to previous surface sampling conducted in October, 1995, to determine the approximate vertical and horizontal extent of subsurface contamination at the Site due to this release (Illinois Environmental Protection Agency Spill #941772). This site investigation report provides: site geology and hydrology, a description of the field work performed; methods, procedures, and analyses used; chemical analytical data; and a summary of contaminant occurance. The location of the Site is illustrated on Figure 1.

## 1.2 SITE HISTORY AND DESCRIPTION

On August 9, 1994, Clark had a release of approximately 2,000 barrels of gasoline due to a ruptured gasket on the mixer for Tank 35-2. The majority of product was contained within the dike surrounding Tanks 35-2 and 35-1. Minimal product was observed in drainage ditches around Tanks 35-3, 55-1, 55-3, and 120-9. During the incident, firefighting foam was applied to the area to minimize vapors and explosion hazards. Representatives from both the United States Coast Guard and the Illinois Environmental Protection Agency (IEPA) visited the site.

Clark personnel used vacuum trucks to recover free product and water from the areas surrounding the tank. Clark estimated approximately 1,995 barrels of product and 3,600 barrels of water and entrained gasoline were recovered by this process. Recovered product was rerun through the process units, while recovered water was treated at Clark's aggressive biological wastewater treatment process. Following drying of the site, Clark initiated a modified biological augmentation program to remediate the soil by applying activated sludge from the aggressive biological wastewater treatment process. A composite soil sample was collected on June 5, 1995 to determine levels of petroleum hydrocarbons in the soil.

On June 20, 1995, Clark began excavating soil from the area around Tanks 35-1 and 35-2. Between June 20 and June 27, 1995, twenty-two roll-off containers were loaded with soil. Approximately 225 cubic yards of soil was disposed of at Laidlaw Landfill in Roxana, Illinois. Grab soil samples were collected by Clark on August 1 and October 12, 1995 from the same locations as the previous composite sample and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) and polynuclear aromatics (PNAs). A more detailed description of the original sampling activities at the Site is contained in the Burns & McDonnell Waste Consultants, Inc. (BMWCI) report Summary Report of Spills at the Clark Hartford Refinery for Clark Refining and Marketing, Inc. of November 1995. The Site is depicted in Figure 2.

* * * * *

# 2.0 HYDROGEOLOGY

## 2.1 REGIONAL HYDROGEOLOGY

The Site lies within the Alluvial Valleys Region as defined in United States Geological Survey Water-Supply Paper 2242, 1984. The Alluvial Valleys Region is commonly underlain by sand and gravel as well as silt and clay. The surficial deposit of sand and gravel is commonly underlain by interbedded silt and clay in turn underlain by a basal layer of sand and gravel. Locally, these units are collectively known as Cahokia Alluvium. The subsurface material in the Site area consists of Quarternary Alluvium, which is made up of modern river floodplain deposits of poorly-sorted sands, silts, and clays with some sandy gravel. The alluvium ranges in thickness from 50 to 200 feet below the ground surface (bgs).

The sequence of deposits in the Alluvial Valleys Region is dependant on the depositional history. The sands and gravels in the valleys of major streams, such as the Mississippi River, are commonly overlain by deposits of clay and other fine-grained alluvium deposited during floods following the end of the glacial period.

The alluvial deposits are recharged by precipitation on the valleys, groundwater moving from the adjacent and underlying aquifers, and overbank flooding of the streams. Water in the alluvial deposits discharges to the streams in the valleys.

The underlying bedrock in the Hartford area is composed of Mississippian age interbedded limestones, sandstones, and shales of the Lower Chesterian Series. Regionally, these units dip east toward the center of the Illinois Basin. The Illinois Basin is the major geologic structure in the region.

## 2.2 LOCAL HYDROGEOLOGY

Soil borings were completed to a maximum of 7 feet below ground surface (bgs) at this location. Sediments encountered during drilling included mainly grey to black silty clays with some shallow sand and gravel. Groundwater was not encountered during drilling. Soil boring logs are included as Appendix A.

* * * * *

# 3.0 FIELD INVESTIGATION ACTIVITIES

To determine the approximate vertical and horizontal extent of petroleum hydrocarbons at the Site, fourteen surface soil samples were collected and seven soil borings were drilled and sampled. The sampling locations were concentrated around Tanks 35-1, 35-2 and 35-3, and are shown on Figure 2.

## 3.1 SURFACE SOIL SAMPLE COLLECTION

To determine the presence of surface contaminants in the vicinity of the release, fourteen surface soil samples were collected and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (EPA) Method 8020. Surface soil samples were collected at a depth of 6 inches below ground surface, to insure sampling of native soil, and were collected prior to completion of the borings with a drill rig. Soil was placed in laboratory-cleansed jars

## 3.2 DRILLING AND SUBSURFACE SOIL SAMPLE COLLECTION

Seven soil borings were drilled in the vicinities of Tanks 35-3, 35-2, and 35-3. The first 2.5 feet of each boring was field screened with a photoionization detector (PID). Each boring was completed to a depth of 5 feet below the highest PID reading measured in the top 2.5 feet. Soil borings were drilled using an all-terrain vehicle (ATV) mounted drill rig with hollow stem augers and were continuously sampled using split spoon samplers. Drilling logs are included in Appendix A.

Subsurface soil samples were collected from the location of the highest PID reading and from the bottom of the boring. In borings with no elevated PID readings, samples were collected from the bottom of the boring only. Soil samples were removed from the samplers with minimal disturbance and placed in laboratory-cleansed jars. Subsurface soil samples were analyzed for BTEX by EPA Method 8020.

## 3.3 SAMPLE COLLECTION PROTOCOL

Personnel responsible for activities associated with collection of soil samples followed standard procedures to reduce the possibility of contamination and cross-contamination of the samples prior to delivery to the laboratory. Clean, decontaminated sampling equipment was used at each sampling location. Soil samples were packed into a cooler with ice and promptly delivered to the analytical laboratory using chain-of-custody procedures. All laboratory analyses were performed in accordance with EPA methodology by American Technical and Analytical Services, Inc., of Maryland Heights, Missouri. The laboratory results and chain-of-custody forms for surface soil samples are included in Appendix B.

* * * * *

# 4.0 CONTAMINANT OCCURRENCE

Fourteen surface and seven subsurface soil samples were collected and submitted for laboratory chemical analysis to delineate the approximate horizontal and vertical extent of soil impacted by petroleum hydrocarbons at the site. The analytical laboratory reports are contained in Appendix B.

## 4.1 SURFACE SOIL SAMPLES

Of the fourteen surface soil samples collected, six fall within acceptable contaminant limits. Soil samples S-2, S-4, S-5, S-7, S-11, and S-12 are all below the Illinois EPA Tiered Approach to Cleanup Objectives (TACO) Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties. The remaining soil samples all exceed TACO Tier 1 values for at least one BTEX constituent. The results of surface soil sample analyses are summarized in Table 1.

## 4.2 SUBSURFACE SOIL SAMPLES

Eleven subsurface soil samples were collected and submitted for laboratory analysis of BTEX. Six samples, soil samples SB-1-1, SB-2-2, SB-3-2, SB-3-7, SB-4-7, and SB-7-5, all exceed TACO Tier 1 values for at least one BTEX constituent. Soil samples SB-1-5, SB-2-2, SB-4-2, and SB-5-5 are below TACO Tier 1 values for TEX and below detection limits for benzene; however, the detection limits for benzene in these analyses are above the TACO Tier 1 value due to necessary dilution. These samples are therefore inconclusive with respect to benzene. Soil samples SB-2-7 and SB-5-5 are below TACO Tier 1 values for all BTEX constituents. The results of subsurface soil sample analyses are summarized in Table 2.

* * * * *

## 5.0 CONCLUSIONS

- No free petroleum product was encountered during surface soil sampling.

- Surface soil samples S-1, S-3, S-6, S-8, S-9, S-10, S-13, and S-14 all exceed TACO Tier 1 values for one or more BTEX constituents.

- Subsurface soil samples SB-1-1, SB-2-2, SB-3-2, SB-3-7, SB-4-7, and SB-7-5 all exceed the TACO Tier 1 values for one or more BTEX constituent.

- Subsurface soil samples SB-1-5, SB-2-2, SB-4-2, and SB-5-5 are all undefined with respect to benzene due to laboratory dilutions.

- Subsurface contaminant levels decrease with depth in soil borings.

- The low permeability silty clay soil in the subsurface along with the Clark's immediate removal of free product at the time of the spill decrease the risk for contaminant migration to groundwater caused by this release.

*****

# ᵢBLE 1

## Summary of Surface Analytical Results
## Clark Refining & Marketing, Inc.
## Area B, Tank 35-2 Tank Yard
## Hartford, Illinois

| Sample Number: | | TACO | S-1 | | S-2 | | S-3 | | S-4 | | S-5 | | S-6 | | S-7 | | S-8 | | S-9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | |
| COMPOUND | | | | | | | | | | | | | | | | | | | | |
| BTEX | | | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 1,250 | 6,500* | 1 | 13 | 1,250 | 3,900* | 1 | BDL | 1 | BDL | 5 | 35* | 1 | BDL | 1,250 | 2,400* | 1,250 | 12,000* |
| Toluene | µg/Kg | 5,000 | 1,250 | 69,000* | 1 | 4 | 1,250 | 1,700 | 1 | 1 | 1 | BDL | 5 | BDL | 1 | BDL | 1,250 | 1,800 | 1,250 | 53,000* |
| Ethylbenzene | µg/Kg | 5,000 | 1,250 | 36,000* | 1 | 4 | 1,250 | 4,800 | 1 | BDL | 1 | BDL | 5 | BDL | 1 | BDL | 1,250 | 3,800 | 1,250 | 19,000* |
| Xylenes (total) | µg/Kg | 74,000 | 1,250 | >75,000* | 1 | 49 | 1,250 | 110,000* | 1 | BDL | 1 | 1 | 5 | 130 | 1 | BDL | 1,250 | 90,000* | 1,250 | >75,000* |
| Total BTEX | µg/Kg | | | >186,500 | | 70 | | 120,400 | | 1 | | 1 | | 165 | | BDL | | 98,000 | | >159,000 |

| Sample Number: | | TACO | S-10 | | S-11 | | S-12 | | S-13 | | S-14 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | |
| COMPOUND | | | | | | | | | | | | |
| BTEX | | | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 125 | 260* | 1 | BDL | 1 | BDL | 1,250 | 53,000* | 5 | 100* |
| Toluene | µg/Kg | 5,000 | 125 | 340 | 1 | BDL | 1 | BDL | 1,250 | >75,000* | 5 | 40 |
| Ethylbenzene | µg/Kg | 5,000 | 125 | BDL | 1 | BDL | 1 | BDL | 1,250 | >75,000* | 5 | 240 |
| Xylenes (total) | µg/Kg | 74,000 | 125 | 810 | 1 | 1 | 1 | BDL | 1,250 | >75,000* | 10 | 330 |
| Total BTEX | µg/Kg | | | 1,410 | | 1 | | BDL | | >278,000 | | 710 |

1 - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

DL - Detection Limit

µg/Kg - Microgram per kilogram

BDL - Below detection limit

NL - Compound not listed in TACO Tier 1, Table B

488* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwater)

# TABLE 2
## Summary of Subsurface Analytical Results
## Clark Refining & Marketing, Inc.
## Area B, Tank 35-2 Tank Yard
## Hartford, Illinois

| Sample Number: | | TACO | SB-1-1 | | SB-1-5 | | SB-2-2 | | SB-2-7 | | SB-3-2 | | SB-3-7 | | SB-4-2 | | SB-4-7 | | SB-5-5 | | SB-6-5 | | SB-7-5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/05/96 | | 06/05/96 | |
| COMPOUND | | | | | | | | | | | | | | | | | | | | | | | | |
| BTEX | | | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 1,250 | 3,200* | 1250** | BDL | 1250** | BDL | 1 | 19 | 1,250 | 2700* | 125 | 330* | 1250** | BDL | 5 | 62 | 125** | BDL | 1 | 16 | 10 | 380* |
| Toluene | µg/Kg | 5,000 | 1,250 | 15,000* | 1,250 | 2,800 | 1,250 | 3,200 | 1 | 9 | 1,250 | BDL | 125 | BDL | 1,250 | BDL | 5 | 8 | 125 | 150 | 1 | 7 | 10 | 27 |
| Ethylbenzene | µg/Kg | 5,000 | 1,250 | 15,000* | 1,250 | BDL | 1,250 | 7,900* | 1 | 40 | 1,250 | 11,000* | 125 | 350 | 1,250 | 4,600 | 5 | 67 | 125 | 580 | 1 | 4 | 10 | 59 |
| Xylenes (total) | µg/Kg | 74,000 | 1,250 | >75,000* | 1,250 | 11,000 | 1,250 | 46,000 | 125 | 190 | 1,250 | >75,000 | 125 | 470 | 1,250 | 29,000 | 5 | 97 | 125 | 1,600 | 1 | 8 | 10 | 79 |
| Total BTEX | µg/Kg | | | >109,200 | | 13,800 | | 57,100 | | 258 | | >88,700 | | 1,150 | | 33,600 | | 224 | | 2,330 | | 35 | | 545 |

[1] - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

DL - Detection Limit

µg/Kg - Microgram per kilogram

BDL - Below detection limit

NL - Compound not listed in TACO Tier 1, Table B

488* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwater)

1250** - Detection limit exceeds TACO Tier 1, Table B value

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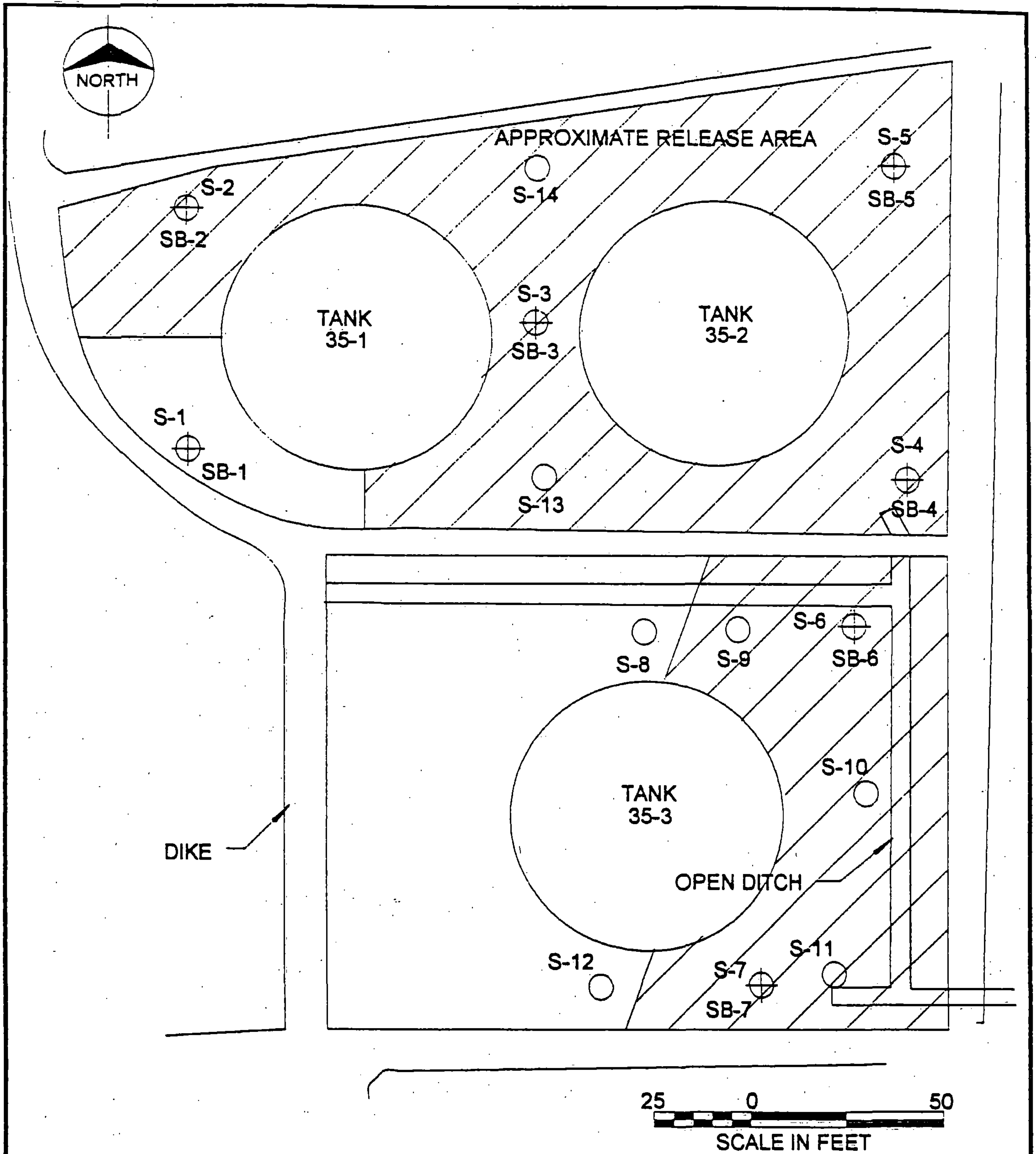


LEGEND

S-7 / SB-7 - SOIL BORING AND SURFACE BTEX SAMPLE LOCATION

S-11 - SURFACE BTEX GRAB SAMPLE LOCATION

Burns & McDonnell Waste Consultants, Inc.

FIGURE 2

Soil Sampling Locations
Tank 35-2 Yard
Release #941772
Clark Refining & Marketing, Inc.

BM279\PROJECTS\94155\4056\CADD\35-1-2-3.DW2

FILE

FILE NUMBER 070.50.01.08 080.58.47

RETAIN IN FILE UNTIL ________

CLARK

201 East Hawthorne
Hartford Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

November 10, 1997

Mr. Jim O'Brien, Manager
Office of Chemical Safety
Illinois Environmental Protection Agency
P.O. Box 19726
Springfield, IL 62794-9726

Re: Tiered Approach Objective Assessment

Dear Mr. O'Brien,

Enclosed is a copy of the Tiered Approach Objective assessment for the spill sites at the Hartford Refinery that was prepared by Burns & McDonnell. Clark Refining and Marketing, Inc. will provide your department with remediation techniques for two of the remaining sites in the near future.

Please call me at 618-254-7301, extension 218 with your questions.

Sincerely,

M. Modarres

Massood Modarres
Environmental Engineer

cc: John Sherrill
Tom Miller
File ✓

Burns & McDonnell | Waste Consultants, Inc.

November 3, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery: IEPA Spill Nos. 940851, 941772, 942837, 941526, 930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this Tiered Approach to Cleanup Objectives (TACO) assessment of the above-listed spill sites at the Clark Hartford Refinery. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. In this letter report, the data compiled in the September 1996 report for each spill site is evaluated for compliance with TACO Tier I and Tier II cleanup objectives.

## SOIL SAMPLES

Soil sample analytical data for surface and subsurface samples is summarized in Tables 1 and 2, respectively. Tables 1 and 2 are condensed from the September 1996 report and list only the contaminants detected at each spill site in excess of TACO Tier I Cleanup Objectives for Industrial/Commercial properties. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. Spill areas are shown on a map of the refinery, included as Figure 1. Samples from areas that are not listed in the tables were all below the Industrial/Commercial cleanup objectives. TACO Tier 1 Exposure-Route Specific Values for Soils are summarized for the contaminants of concern in Table 3 for the Industrial/Commercial, Construction Worker, and Migration to Groundwater scenarios.

In addition to the soil sampling completed for the September 1996 report, soil samples were collected September 23, 1997 from four areas for analysis of organic carbon. Soil samples were collected from two locations each in Areas B, C, H, and J, and analyzed for

17 Cassens Court
Fenton, Missouri 63026

Phone: 314 305-0077
Fax: 314 326-8295
http://www.burnsmcd.com

Organic Matter using ASTM D2974-87 and for Total Organic Carbon using EPA SW-846. The samples were collected from below the contaminated zone at depths ranging from 7 to 12 feet below ground surface. Analytical data is presented in Table 4. Although both methods are approved for determination of the fraction of organic carbon ($f_{oc}$), the site-specific $f_{oc}$ values used for this assessment were calculated from the ASTM method of analyzing for organic matter. These values are also presented in Table 4.

**TIER II CLEANUP OBJECTIVES**

The site-specific $f_{oc}$ was evaluated for Areas B, C, H, and J so that site-specific cleanup objectives could be calculated for the Migration to Groundwater pathway. The TACO Tier I cleanup objectives given in TACO Appendix B, Table A for the Migration to Groundwater pathway are calculated for subsurface soil samples with a default $f_{oc}$ value of 0.002 gm/gm. Table 5 presents the site-specific cleanup objectives for the Migration to Groundwater pathway in addition to the surface and subsurface soil default objectives. The site-specific cleanup objectives were calculated using Equation S17 in TACO Appendix C, Table A. Default values for clay soil were used for density and porosity values.

To use calculated site-specific cleanup objectives, TACO specifies three additional concentration limits that cannot be exceeded for a site:

- the soil saturation limit for each chemical (calculated according to Section 742.220) cannot be exceeded,

- the soil attenuation capacity for each site (calculated according to Section 742.215) cannot be exceeded, and

- a weighted average of 1 (calculated according to Section 742.720) cannot be exceeded at each site for chemicals that target the same organ.

According to TACO Table E in Appendix A, the contaminants of concern to this study that target the same organ include only toluene and ethylbenzene, which both target the kidneys. These contaminants are present together above TACO Tier 1 Industrial/Commercial cleanup objectives for Area B only. Of the 8 samples listed in Table 1, the weighted average exceeds 1 for samples S-1 and S-13.

The soil attenuation capacity is represented by the organic carbon concentration in the soil at each site. The total concentration of all organic contaminants of concern at a site is

compared to the total organic material in the soil at that site. The total organic contaminant concentrations for all areas discussed in this assessment fall below the default organic matter concentration of 2000 milligrams per kilogram (mg/kg). (Please refer to the September 1996 report for complete soil analytical data.)

Soil saturation limits for benzene, toluene, ethylbenzene, and xylenes (BTEX) are given in TACO Appendix A, Table A. As indicated in the footnotes of Table 5, soil saturation limits are used as cleanup objectives when calculated objectives exceed the saturation limits.

**TIER II ASSESSMENTS**

In the following pages, each area is individually evaluated relative to the calculated TACO Tier II cleanup objectives presented in Table 5. All of the areas discussed in this assessment are areas that do not support full-time workers or structures. Clark personnel are present in the areas only intermittently and these areas are not generally accessible to the public. It is therefore reasonable at each of these sites that the construction worker scenario be used for the ingestion and inhalation cleanup objectives.

Each of the assessment pages in Attachment A addresses the status of a single area. The contaminants of concern (COCs) in both surface and subsurface soil are represented by the highest concentration for each in that area (refer to Tables 1 and 2 for complete soil sample information). In cases were detection limits exceed the cleanup objectives, non-detect samples are considered to be in excess of the cleanup objectives. The limiting scenario(s) for each area are determined by selecting the most conservative cleanup objectives from Table 5. The Tier II assessment for each area is then a direct comparison of the site data with the most conservative site-specific cleanup objectives.

**SUMMARY**

TACO assessment of each of the areas at the Clark Refinery, as shown in Attachment A, indicates that Areas A, E, F, G, and H are all below TACO Tier II cleanup objectives for the applicable contaminant pathway scenarios. These areas do not require further assessment or remediation.

Area B, surrounding Tank 35-2 in the tank yard, has surface and subsurface concentrations of BTEX constituents that exceed the TACO Tier II cleanup objectives. The cleanup objectives for this area include the calculated site-specific concentration for benzene (migration to groundwater pathway), and the construction worker scenario concentrations for TEX.

Area C, surrounding Tank 55-1 in the tank yard, has subsurface soil concentrations of benzene in two samples that exceed the Tier II cleanup objectives. The benzene cleanup objective for this area is a calculated site-specific concentration for the migration to groundwater pathway.

Area D, surrounding Tank 10-5 in the tank yard, has surface and subsurface soil concentrations of benzene that exceed Tier II cleanup objectives. The benzene cleanup objectives for this area are the generic TACO Tier I values, migration to groundwater pathway, for surface and subsurface soil.

Area J, along Illinois Route 3, has two subsurface soil samples in excess of the Tier II cleanup objectives for benzene, and one subsurface soil sample in excess of the Tier II cleanup objectives for benzo(b)fluoranthene and dibenzo(a,h)anthracene. The cleanup objectives for this area are calculated site-specific concentrations, migration to groundwater pathway, for these three contaminants.

If you have any questions concerning this assessment, please contact me at (314) 305-0077, ext. 226.

Sincerely,

Paul Christian
Project Manager

attachment

# Table 1
## Tier II Surface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area A | | Area B | | | | | | | | Area C | Area D | | Area E | Area J | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S-5 | S-6 | S-1 | S-3 | S-6 | S-8 | S-9 | S-10 | S-13 | S-14 | S-8 | S-2 | S-4 | S-13 | SB-5S | SB-6S |
| Benzene | -- | -- | 6.6 | 3.9 | 0.036 | 2.4 | 12 | 0.26 | 53 | 0.1 | -- | 0.27 | 3.1 | -- | -- | -- |
| Toluene | -- | -- | 69 | -- | -- | -- | 53 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | 36 | -- | -- | -- | 19 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | >75 | 110 | -- | 90 | >75 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | 1.21 | 0.851 | -- | -- | [illegible] | -- | -- | -- | -- | -- | 2.90 | -- | -- | 1.26 | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | 1.03 | 2.25 | -- | -- | -- | -- | -- | -- | -- | -- | 4.28 | -- | -- | -- | 2.10 | 1.16 |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 2
## Tier II Subsurface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area B | | | | | | | | | Area C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-1 | SB1-5 | SB2-2 | SB3-2 | SB3-7 | SB4-2 | SB4-7 | SB5-5 | SB7-5 | SB1-2 | SB1-7 | SB3-2.5 | SB3-7.5 |
| Benzene | 3.2 | <1.25 | <1.25 | 2.7 | 0.33 | <1.25 | 0.062 | <0.125 | 0.38 | 0.17 | -- | 0.27 | 1.5 |
| Toluene | 15 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | 16 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | >75 | -- | -- | >75 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.871 | -- | -- |

| | Area D | | | | | | | | Area H | Area J | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-2 | SB1-7 | SB2-1 | SB2-6 | SB3-1 | SB3-6 | SB4-2 | SB4-7 | SB1-2 | SB1-8 | SB1-13 | SB3-8 | SB3-13 |
| Benzene | 0.16 | 4 | 0.24 | 0.87 | 0.13 | 0.21 | 0.11 | 2.6 | 0.059 | 0.034 | -- | <0.125 | 0.2 |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.94 | -- | 4.09 | 3.93 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 23.30 | -- | -- | 5.65 |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.9 | 1.28 | 1.92 | 1.78 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 238 | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 18.2 | 2.37 | 3.97 | 3.08 |

* All sample data reported in milligrams per kilogram (mg/kg)

## Table 3
## Exposure-Route Specific Values for Soils
## Illinois Tiered Approach to Cleanup Objectives

| | Industrial/Commercial | | Construction Worker | | Migration to Groundwater |
|---|---|---|---|---|---|
| | Ingestion | Inhalation | Ingestion | Inhalation | |
| Benzene | 200 | 1.5 | 4,300 | 2.1 | 0.03 |
| Toluene | 410,000 | 650 | 410,000 | 42 | 12 |
| Ethylbenzene | 200,000 | 400 | 20,000 | 58 | 13 |
| Xylenes | 1,000,000 | 410 | 410,000 | 410 | 150 |
| Benzo(a)anthracene | 8 | – | 170 | – | 2 |
| Benzo(b)fluoranthene | 8 | – | 170 | – | 5 |
| Benzo(a)pyrene | 0.8 | – | 17 | – | 8 |
| Chrysene | 780 | – | 17,000 | – | 160 |
| Dibenzo(a,h)anthracene | 0.8 | – | 17 | – | 2 |

* All sample data reported in milligrams per kilogram (mg/kg)

**All information reproduced from Title 35, Subtitle G, Chapter I, Subchapter f, Part 742, Appendix B, Table B

# Table 4
## Summary of Fraction Organic Carbon Analysis
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| Sample Location & Number | Sample Date | Organic Matter ASTM D2974-87 | Tot. Organic Carbon EPA SW-846 | Average Fraction Organic Carbon[1] |
|---|---|---|---|---|
| Area B - 1 | 09/23/97 | 15,000 | 830 | |
| Area B - 2 | 09/23/97 | 13,900 | 5952 | 0.0145 |
| Area C - 1 | 09/23/97 | 10,800 | 5353 | |
| Area C - 2 | 09/23/97 | 14,800 | 1107 | 0.0128 |
| Area H - 1 | 09/23/97 | 14,600 | 2288 | |
| Area H - 2 | 09/23/97 | 2,570 | 5371 | 0.0089 |
| Area J -1 | 09/23/97 | 7,800 | 2578 | |
| Area J - 2 | 09/23/97 | 2,300 | 2411 | 0.0051 |

* All sample data reported in milligrams per kilogram (mg/kg)

[1] = Average is calculated using ASTM Method data only.

## Table 5
## Tier II Cleanup Objectives - Soil
## Industrial/Residential Scenario
## Migration to Groundwater Pathway
## Illinois Tiered Approach to Cleanup Objectives

| | TACO Generic Cleanup Objectives | | Site Specific Cleanup Objectives | | | |
|---|---|---|---|---|---|---|
| | Surface | Subsurface | Area B | Area C | Area H | Area J |
| | (foc =0.006) | (foc = 0.002) | (foc = 0.015) | (foc = 0.013) | (foc = 0.009) | (foc = 0.005) |
| Benzene | 0.09 | 0.03 | 0.225 | 0.195 | 0.135 | 0.075 |
| Toluene | 36 | 12 | 90 | 78 | 54 | 30 |
| Ethylbenzene | 39 | 13 | 97.5 | 84.5 | 58.5 | 32.5 |
| Xylenes | 410** | 150 | 410** | 410** | 410** | 375 |
| Benzo(a)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |
| Benzo(b)fluoranthene | 15 | 5 | 37.5 | 32.5 | 22.5 | 12.5 |
| Benzo(a)pyrene | 24 | 8 | 60 | 52 | 36 | 20 |
| Chrysene | 480 | 160 | 1,200 | 1,040 | 720 | 400 |
| Dibenzo(a,h)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |

* All sample data reported in milligrams per kilogram (mg/kg)

** Cleanup Objective calculations are limited by the soil saturation concentration (410 mg/kg)

ATTACHMENT A

TACO Tier II Assessment Sheets

| | |
|---|---|
| LOCATION: | Area A - NW of Biological Treatment Unit |
| MEDIA: | Soil |
| CLASSIFICATION: | ~~Industrial/Commercial with no full time~~ workers and no structures. Use Construction Worker scenario. |

| | | |
|---|---|---|
| COCs - SURFACE: | Benzo(a)pyrene | 1.21 mg/kg |
| | Dibenzo(a,h)anthracene | 2.25 mg/kg |
| COCs - SUBSURFACE: | N/A | |
| LIMITING SCENARIO: | Migration to Groundwater (generic surface): | |
| | Benzo(a)pyrene | 24 mg/kg |
| | Dibenzo(a,h)anthracene | 6 mg/kg |

TIER II ASSESSMENT:

Surface soil concentrations of both benzo(a)pyrene and dibenzo(a,h)anthracene are below the cleanup objectives for both the construction worker scenario and the migration to groundwater scenario.

| | | |
|---|---|---|
| LOCATION: | Area B - Tank 35-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial Commercial with no full time workers and no structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 53 mg/kg |
| | Toluene | >75 mg/kg |
| | Ethylbenzene | >75 mg/kg |
| | Xylenes | >75 mg/kg |
| COCs - SUBSURFACE: | Benzene | 3.2 mg/kg |
| | Toluene | 15 mg/kg |
| | Ethylbenzene | 16 mg/kg |
| | Xylenes | >75 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.225 mg/kg |
| | Construction Worker: | |
| | Toluene | 47 mg/kg |
| | Ethylbenzene | 58 mg/kg |
| | Xylenes | 410 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-1, S-3, S-8, S-9, S-10, and S-13 are in excess of the limiting scenario cleanup objective for benzene; surface soil samples S-1, S-9, and S-13 exceed the objective for toluene; surface soil sample S-13 exceeds the ethylbenzene objective, and surface soil samples S-1, S-9, and S-13 exceed the xylenes cleanup objective. In addition, the weighted average of toluene and ethylbenzene concentrations exceed 1 for soil samples S-1 and S-13.

Subsurface soil samples SB1-1, SB1-5, SB2-2, SB3-2, SB3-7, SB4-2, and SB7-5 are in excess of limiting scenario cleanup objectives for benzene. Subusurface soil samples SB1-1 and SB3-2 are potentially in excess of the cleanup objective for xylenes.

| | | |
|---|---|---|
| LOCATION: | Area C - Tank 55-1 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full-time workers or structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 2.90 mg/kg |
| | Dibenzo(a,h)anthracene | 4.28 mg/kg |
| COCs - SUBSURFACE: | Benzene | 1.5 mg/kg |
| | Dibenzo(a,h)anthracene | 0.971 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.195 mg/kg |
| | Dibenzo(a,h)anthracene | 13 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below cleanup objectives for both the construction worker scenario (Table 3) and the site-specific migration to groundwater scenario (Table 5).

Subsurface soil samples SB3-2.5 and SB3-7.5 are in excess of the migration to groundwater scenario benzene cleanup objective. All subsurface soil samples are below cleanup objectives for dibenzo(a,h)anthracene.

| | | |
|---|---|---|
| LOCATION: | Area D - Tank 10-5 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | ~~Industrial/Commercial with no full-time workers and no~~ structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 3.1 mg/kg |
| COCs - SUBSURFACE: | Benzene | 4.0 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (generic): | |
| | Benzene (surface) | 0.09 mg/kg |
| | Benzene (subsurface) | 0.03 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-2 and S-4 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

Subsurface soil samples SB1-2, SB1-7, SB2-1, SB2-6, SB3-1, SB3-6, SB4-2, and SB4-7 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

| | | |
|---|---|---|
| LOCATION: | Area E - Tank 120-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 1.25 mg/kg |
| COCs - SUBSURFACE: | NA | |
| LIMITING SCENARIO: | Construction Worker:<br>Benzo(a)pyrene | <br>17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario for benzo(a)pyrene.

All subsurface soil samples are below all cleanup objectives for both the construction worker and migration to groundwater scenarios.

| | |
|---|---|
| LOCATION: | Area F - Tank 200-1 |
| MEDIA: | Soil |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. |
| COCs - SURFACE: | NA |
| COCs - SUBSURFACE: | NA |
| LIMITING SCENARIO: | NA |

TIER II ASSESSMENT:

All surface and subsurface soil samples are below all applicable cleanup objectives.

LOCATION: Area G - Sulfuric Acid Spill Area

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

Surface soil samples were analyzed for pH and found to be within the normal limits for soil acidity.

| | |
|---|---|
| LOCATION: | Area H - Hawthorne |
| MEDIA: | Soil |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. |
| COCs - SURFACE: | NA |
| COCs - SUBSURFACE: | Benzene 0.059 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific):<br>Benzene 0.135 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below all applicable TACO Tier I cleanup objectives.

All subsurface soil samples are below the site-specific migration to groundwater cleanup objective calculated for benzene.

| | | |
|---|---|---|
| LOCATION: | Area J - Route 3 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Dibenzo(a,h)anthracene | 2.10 mg/kg |
| COCs - SUBSURFACE: | Benzene | 0.20 mg/kg |
| | Benzo(a)anthracene | 4.94 mg/kg |
| | Benzo(b)fluoranthene | 23.3 mg/kg |
| | Benzo(a)pyrene | 9.9 mg/kg |
| | Chrysene | 238 mg/kg |
| | Dibenzo(a,h)anthracene | 18.2 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.075 mg/kg |
| | Benzo(a)anthracene | 5 mg/kg |
| | Benzo(b)fluoranthene | 12.5 mg/kg |
| | Chrysene | 400 mg/kg |
| | Dibenzo(a,h)anthracene | 5 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario and the site-specific migration to groundwater scenario.

Subsurface soil samples SB3-8 and SB3-13 are in excess of the site-specific migration to groundwater cleanup objectives for benzene. Subsurface soil sample SB1-8 is in excess of the migration to groundwater cleanup objectives for both benzo(b)fluoranthene and dibenzo(a,h)anthracene.

FILE NUMBER 070.05 SPILLS-RESOLVED (Brook - 11-30)

FILE UNIT

Burns & McDonnell | Waste Consultants, Inc.

November 20, 1997

Old Refinery Historic Contamination

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery:
IEPA Spill Nos. 940851, 941772, 942837, 941526,
930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this proposal for remediation activities at the Clark Refinery Spill Sites listed above. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. A Tiered Approach to Cleanup Objectives (TACO) Tier II assessment of each area was also completed by BMWCI and summarized in the November 3, 1997 BMWCI letter to the Illinois Environmental Protection Agency (IEPA). In the November 3, 1997 letter, Areas A, E, F, G, and H were all determined to be below Tier II cleanup objectives, making remediation of these areas unnecessary. This letter, on the basis of the TACO Tier II assessment, presents Clark's proposed remedial approaches for each of the remaining spill areas (Areas B, C, D, and J).

A ⇒ asphalt
E ⇒ Crude
F ⇒ Crude & gasoil
G ⇒ $H_2SO_4$
H ⇒ gasoil

B Bioremediation

As detailed in the November 3, 1997 letter, Area B (gasoline) has surface and subsurface soil samples in excess of TACO Tier II cleanup objectives (CUOs) for benzene, toluene, ethylbenzene, and xylenes (BTEX). Of the 7 subsurface soil samples in excess of Tier II CUOs, 4 are located within the top 2 feet of the surface, including the 2 samples with the highest benzene concentrations. As the majority of the contamination is shallow (less than 2 feet below ground surface), proposed remediation efforts at this area include surface application of heterotrophic bacteria and soil aeration through disking. Therefore, remediation efforts will be concentrated on the top 2 feet of soil in this area.

17 Cassens Court
Fenton, Missouri 63026

Phone: 314 305-0077
Fax: 314 326-8295

Waste Consultants, Inc.

Mr. O'Brien
November 20, 1997
Page 2

gasoil

Area C, as detailed in the November 3, 1997 letter, has only two samples in excess of Tier II CUOs for benzene. Both of the subsurface soil samples were collected from soil boring SB-3 at depths of 2.5 and 7.5 feet bgs, indicating localized historical contamination. As these benzene concentrations do not appear to be related to the spill event of interest in this report, additional remediation activities are not proposed for Area C.

Naptha & Toluene

A TACO Tier II assessment of Area D was not possible due to difficulty in collecting a site-specific sample for organic carbon analysis. Area D is within the tank farm and is directly across an access road from Area C. Assuming that the fraction of organic carbon in the two areas is comparable, and thereby applying the site-specific CUOs from Area C to Area D, three shallow subsurface soil samples fall below site-specific CUOs. Thus there are two surface and five subsurface soil samples in excess of Tier II CUOs for benzene. The majority of the contamination above Tier II CUOs is subsurface and historical in nature. As these benzene concentrations are not related to the spill event of interest in this report, additional remediation activities are not proposed for Area D.

#2 fuel oil

Area J is along the Route 3 levee in Hartford, Illinois and is under the jurisdiction of both the Wood River Levee District and the Army Corps of Engineers. Access to this area is highly limited by both bureaucratic and physical obstacles. The spill area is only intermittently accessible to vehicle traffic. In addition, the contamination in this Area in excess of TACO Tier II CUOs is limited to subsurface soil. Therefore, additional remediation activities are not proposed for this spill area.

If you have any questions about the proposed remediation activities presented in this letter, please contact me at (314) 305-0077, ext. 226.

Sincerely,

fc)
Paul Christian
Project Manager

bm1134\projects\clark\refinery\corresp\1120ltr.wpd

Clayton GROUP SERVICES

# APPENDIX P-7

## AREA F TANK 200-1 SPILL AREA
## IEMA INCIDENTS 942288, 941873, 942855, 951217

# Office of the Attorney General
State of Illinois

March 11, 1996

Jim Ryan
Attorney General

Pat Sharkey
Mayer, Brown and Platt
190 South LaSalle Street
Chicago, IL 60603-3441

RE: Clark Hartford / Spill Sampling Plan Revision Approvals

Dear Ms. Sharkey:

I am writing to confirm the Agency's acceptance of the plan for sampling that was discussed at a meeting held on February 27, 1996 between representatives of the State and Clark. Initially, Burns & McDonnell had prepared a Sampling and Analysis Plan for Areas B, C, D, F, H, and J. In my letter dated January 16, 1996, to you we proposed additional sampling in Areas A, E, and G as well as groundwater sampling in Areas K and L. At the February 27, 1996, meeting, representatives of Clark presented the State with a two page table of proposals for sampling at the various areas in response to the issues raised in my letter. Further discussions at that meeting resulted in an apparent agreement regarding a sampling plan acceptable to all parties. Following are the specifics of that plan as it is understood by the Illinois EPA representatives.

| | |
|---|---|
| Area A – representing spill #940851<br><br>Asphalt spill<br><br>Northwest of Bio Unit | Surface samples (one foot below post-cleanup fill interface)<br><br><u>VOC: 4 samples for BTEX</u><br><br><u>PNAs: 3 samples for analysis:</u> One from S-1, a composite of S-2 and S-3, and one from S-4. S-1 and S-4 are intended to be collected just outside the previously remediated area to the south and north respectively. |

| | |
|---|---|
| **Area B -- representing spill #941772**<br><br>Gasoline spill from mixer failure at Tank 35-2<br><br>**Tank Area 35-1 & -2** | **Surface samples (6" to 12" depth)**<br><br>VOC: 7 samples for BTEX (SB-1 thru SB-5 as proposed, and two more north and south of SB-3 in line with SB-2, SB-5 and SB-1, SB-4 respectively)<br><br>**Subsurface samples** (two samples each, collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 5 borings each for BTEX (at proposed SB-1 thru SB-5) |
| **Area B -- representing spill #941772**<br><br>Gasoline spill from mixer failure at Tank 35-2 5<br><br>**Tank Area 35-3** | **Surface samples (6" to 12" depth)**<br><br>VOC: 7 samples for BTEX (5 samples in area affected in east ½ of Tank Area and 2 samples from that part not apparently impacted within the tank dike area)<br><br>**Subsurface samples** (two samples each ,collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 2 borings for BTEX (both in area affected in East ½ of Tank Area) |
| **Area B -- representing spill #941772**<br><br>Gasoline spill from mixer failure at Tank 35-2<br><br>**Tank Area 55-1** | Consolidated with requirements for Area C, since same tank farm affected. |
| **Area C -- representing spills #942837 and #941772**<br><br>Gasoil overfill of Tank 55-1 and overflow of gasoline spill from drainage from Tank Area mixer failure at Tank 35-2<br><br>**Tank Area 55-1** | **Surface samples (6" to 12" depth)**<br><br>VOC: 7 samples for BTEX (4 at SB-1 thru SB-4 and three others: one located between SB-3 and SB-4, one collected between the pipe rack and tank 55-1 adjacent to the easternmost aspect of that tank, and one collected between SB-1 and SB-2)<br><br>PNAs: 4 composite samples, each of 5 discrete sampling points, as indicated in proposal diagram.<br><br>**Subsurface samples** (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>BTEX and PNAs: 4 borings (at SB-1 thru SB-4 as indicated in the proposal diagram) |

| | |
|---|---|
| Area D – representing spill #941526<br><br>Naphtha and toluene<br><br>Tank Area 10-5 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX and Naphthalene (2 at five to ten feet on either side [east & west] of SB-3 and 2 more collected between east-center of tank and dike wall)<br><br>Subsurface samples ( two samples collected from each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 4 borings for BTEX and Naphthalene ( at SB-1 thru SB-4 as proposed) |
| Area E – representing spill #930211<br><br>Crude oil<br><br>Tank Area 120-2 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX ( at SB-1 thru SB-10)<br><br>PNAs: 4 composite samples, each of 5 discrete sampling points as indicated in proposal diagram.<br><br>Subsurface samples (one sample each boring at highest PID reading )<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram) |
| Area F – representing spills #942288, #941873, #942855, and #951217<br><br>Crude oil and gasoline<br><br>Tank Area 200-1 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 8 borings (at SB-1 thru SB-8 as indicated in the proposal diagram). |
| Area G – representing spill #931160<br><br>Sulfuric acid<br><br>Cooling Tower #5 Area | Surface samples (0-12")<br><br>pH: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram). |

| | |
|---|---|
| Area H – representing spill #941913, #942188<br><br>Gasoil<br><br>Area adjacent to Hawthorn Avenue where feed supply lines cross to connect with Tank 120-7 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (of 5 discrete sampling points each as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram). |
| Area J – representing spill #942432 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX ( only SB-1 thru SB-4 as indicated in proposal diagram)<br><br>PNAs: 2 composite samples (of 2 discrete sampling points each as indicated in proposal diagram, SB-1 thru SB-4).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 6 borings (at SB-1 thru SB-6 as indicated in the proposal diagram). |

As for Area K (representing spill #940515 (asphalt)) and Area L (representing Spills #941701, #950726 and #950893 (gasoil, fuel oil and petroleum leaching)), the Agency has received and reviewed the "Field Investigation Workplan for Groundwater Sampling at Clark Refining and Marketing, Inc. Black Oil River Line Release area" dated June 1995 pertaining to Area K and the "Site Assessment Report - Hartford River Terminal for Clark Refining and Marketing, Inc. Hartford, Illinois" dated December 1995 pertaining to Area L. Pursuant to Clark's proposed field investigation workplan and site assessment report for sites "K" and "L", the Agency requests that the wells from each of these sites be sampled and monitored for at least three years. The sampling and monitoring frequency for the first year shall be on a quarterly basis, the second year on a semi-annual basis, and annually thereafter. Sampling shall continue until three consecutive sets of sample data show levels below groundwater quality standards or groundwater cleanup objectives approved by the Agency. The sample parameters proposed by Clark's consultant are acceptable.

In addition, soil boring and sampling results from Area L taken from the December 1995 site assessment report have indicated that volatile samples from selected soil borings are in excess of the TACO Class I soil cleanup objectives. Clark shall provide the Agency with a workplan to address these soils at Area L (River Terminal Location).

The agreed schedule is that Clark shall send final plans for Agency approval two weeks after receipt of this letter. The Agency shall in one week following its receipt of the plans. The plans should be sent to Jim O'Brien with a copy to me. If you have any questions, please do not hesitate to call.

Very truly yours,

James L Morgan

James L. Morgan
Senior Assistant Attorney General
Environmental Bureau, Springfield

enc.

pc: Jim O'Brien

John Waligore

JLM:jm

1190S0008
Clark Oil
SR/Tech

# CLARK

REFINING & MARKETING, INC.

201 East Hawthorne
Hartford, Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

Source: IEPA BOL

April 7, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Division of Environmental Programs
Illinois Environmental Protection Agency
2200 Churchill Road, P.O. Box 19276
Springfield, IL 62794

Re: State vs. Clark, PCB 95-163

Dear Mr. O'Brien,

Please find attached a copy of the Burns & McDonnell Waste Consultants, Inc. report entitled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery dated April 1997. This report summarizes the field sampling activities and analytical results for Areas A through H, and Area J at the Clark Hartford Refinery. Field activities were conducted in accordance with the sampling and analysis plans approved by the Illinois EPA.

The preliminary findings show that Clark's remediation efforts have been successful. Selected areas may require further evaluation. We believe the remediation goals should take into account the former and future industrial use of the sites and the minimal risk of exposure to the public. If you have any questions, feel free to contact Bill Irwin at (618) 254-7301 ext. 266.

Sincerely,

Forrest B. Lauher
Refinery Manager

Enclosure

cc: John Sherrill
Tom Powell
Tom Miller

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Source: IEPA BOL

# SUMMARY REPORT:
# SURFACE AND SUBSURFACE INVESTIGATIONS OF SPILLS AT THE CLARK HARTFORD REFINERY
# FOR
# CLARK REFINING AND MARKETING, INC.
# HARTFORD REFINERY
# HARTFORD, ILLINOIS

SEPTEMBER 1996

**Project No. 94-155-4-056**



**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

TABLE OF CONTENTS

## INTRODUCTION

This report presents the results of nine separate surface and subsurface investigations associated with reported spills at the Clark Refining and Marketing, Inc.'s (Clark) Hartford, Illinois Refinery. These spills occurred between December 6, 1991 and July 7, 1995 at or near the Hartford Refinery. Clark's Hartford Refinery is located in Hartford, Illinois, approximately 10 miles north of St. Louis, Missouri.

The site investigation reports included herein present data obtained as a result of soil sample collection and analysis conducted as part of Clark's efforts to investigate areas impacted by these documented releases. Soil sampling and analysis at each site was conducted according to the site specific Sampling and Analysis Plan generated by Burns & McDonnell Waste Consultants, Inc. (BMWCI) and approved by the Illinois Environmental Protection Agency. BMWCI personnel provided oversight of all field activities described in the following reports.

# SITE INVESTIGATION REPORT
# FOR
# AREA F
# TANK 200-1 SPILL AREA
# ILLINOIS EPA SPILL NOS. 942288, 941873, 942855, 951217
# CLARK REFINING AND MARKETING, INC.
# HARTFORD, ILLINOIS

AUGUST 1996

**94-155-4-056**

**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

## TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 GENERAL

The following describes the site investigation activities used to further characterize the condition of the Tank 200-1 diked area (Site) for Clark Refining & Marketing, Inc. (Clark) in Hartford, Illinois. The results of this characterization were used, in addition to previous surface sampling conducted in October, 1995, to determine the approximate vertical and horizontal extent of subsurface contamination at the Site due to four releases (Illinois Environmental Protection Agency Spill Nos. 942288, 941873, 942855, and 951217). This site investigation report provides: site geology and hydrology, a description of the field work performed; methods, procedures, and analyses used; chemical analytical data; and a summary of contaminant occurance. The location of the Site is illustrated on Figure 1.

## 1.2 SITE HISTORY AND DESCRIPTION

On August 15, 1994, Clark had a release of approximately 100 barrels of crude oil from the aboveground Shell transfer line in the northeast corner of Tank 200-1 diked area. The spill was confined to the northeast corner of the Tank 200-1 tank yard. Clark personnel used vacuum trucks to recover free product from the areas surrounding the release. Clark estimated approximately 98 barrels of product were recovered by this process. Clark initiated a modified biological augmentation program to remediate the soil by applying activated sludge from the aggressive biological wastewater treatment process. A composite soil sample was collected by Clark on June 5, 1995 to determine levels of petroleum hydrocarbons in the soil.

On October 10, 1994, Clark had a release of approximately 25 barrels of gasoline from the Tank 120-4 suction line in the northwest corner of the Tank 200-1 diked tank yard. The released product was contained within the Tank 200-1 dike in a 25 foot by 25 foot area. Clark used vacuum trucks to recover free product from the areas surrounding the release. Clark estimated approximately 24 barrels of product were recovered by this process. Recovered product was rerun through the process units. Clark initiated a modified biological augmentation program to remediate the soil by applying activated sludge from the aggressive biological wastewater treatment process. A composite soil sample was collected by Clark on June 5, 1995 to determine levels of petroleum hydrocarbons in the area around Tank 200-1. On July 13, 1995, Clark began excavating impacted soil from the northwest corner of the Tank 200-1 tank yard. Between July 13 and July 17, 1995, three roll-off containers were loaded with soil. Approximately 35 cubic yards of soil was disposed of at Laidlaw Landfill in Roxana, Illinois.

On December 17, 1994, Clark had a release of approximately 1 barrel of crude oil from an above ground pipeline in the northeast corner of Tank 200-1 tank yard. The spill was confined to the northeast corner of the Tank 200-1 tank yard. The spill occurred in the same area as spill No. 941873. Clark used vacuum trucks to recover free product from the area surrounding the release. Clark estimated approximately 40 gallons of product have been recovered by this process. Recovered product was rerun through the process units.

On June 7, 1995, Clark had a release of approximately 350 barrels of crude oil from a leaking valve on the south side of Tank 200-1. The release was contained within drainage ditches inside the diked areas of Tank 200-1. Clark used vacuum trucks to recover free product and water from the areas surrounding the tank. Clark estimated approximately 699 barrels of product and water to have been recovered by this process. Recovered product was rerun through the process units, while recovered water was treated at Clark's aggressive biological wastewater treatment process. On July 11, 1995, Clark began excavating soil from the area south of Tank 200-1. Between July 11 and July 13, 1995, thirteen roll off containers were loaded with soil and disposed of at a special waste landfill.

Clark resampled the area on October 13, 1995 by collecting grab soil samples from the locations previously sampled for the composite. Samples were analyzed for BTEX and PNAs. A more detailed description of the previous sampling activities and the laboratory results is contained in the Burns & McDonnell Waste Consultants, Inc. (BMWCI) report Summary Report of Spills at the Clark Hartford Refinery for Clark Refining and Marketing, Inc. of November 1995. The Site is depicted in Figure 2.

* * * * *

# 2.0 HYDROGEOLOGY

## 2.1 REGIONAL HYDROGEOLOGY

The Site lies within the Alluvial Valleys Region as defined in United States Geological Survey Water-Supply Paper 2242, 1984. The Alluvial Valleys Region is commonly underlain by sand and gravel as well as silt and clay. The surficial deposit of sand and gravel is commonly underlain by interbedded silt and clay in turn underlain by a basal layer of sand and gravel. Locally, these units are collectively known as Cahokia Alluvium. The subsurface material in the Site area consists of Quarternary Alluvium, which is made up of modern river floodplain deposits of poorly-sorted sands, silts, and clays with some sandy gravel. The alluvium ranges in thickness from 50 to 200 feet below the ground surface (bgs).

The sequence of deposits in the Alluvial Valleys Region is dependant on the depositional history. The sands and gravels in the valleys of major streams, such as the Mississippi River, are commonly overlain by deposits of clay and other fine-grained alluvium deposited during floods following the end of the glacial period.

The alluvial deposits are recharged by precipitation on the valleys, groundwater moving from the adjacent and underlying aquifers, and overbank flooding of the streams. Water in the alluvial deposits discharges to the streams in the valleys.

The underlying bedrock in the Hartford area is composed of Mississippian age interbedded limestones, sandstones, and shales of the Lower Chesterian Series. Regionally, these units dip east toward the center of the Illinois Basin. The Illinois Basin is the major geologic structure in the region.

## 2.2 LOCAL HYDROGEOLOGY

Soil borings were completed to a maximum of 6 feet below ground surface (bgs) at this location. Sediments encountered during drilling included mainly weak red to dark brown and grey silty clays with grass and topsoil at the tops of the columns. Groundwater was not encountered during drilling. Soil boring logs are included as Appendix A.

* * * * *

# 3.0 FIELD INVESTIGATION ACTIVITIES

To determine the approximate vertical and horizontal extent of petroleum hydrocarbons at the Site, fourteen surface soil samples were collected and eight soil borings were drilled and sampled. The sampling locations were concentrated around Tank 120-2 and are shown on Figure 2.

## 3.1 SURFACE SOIL SAMPLE COLLECTION

To determine the presence of surface contaminants in the vicinity of the release, ten surface soil samples were collected and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (EPA) Method 8020, and four composite surface samples (five aliquots per sample) were collected and analyzed for Polynuclear Aromatic Hydrocarbons (PNAs) by EPA Method 8310. Surface soil samples were collected at a depth of 6 inches below ground surface to insure sampling of native soil. Soil samples were placed in laboratory-cleansed jars after collection.

## 3.2 DRILLING AND SUBSURFACE SOIL SAMPLE COLLECTION

Eight soil borings were drilled in the vicinities of Tank 200-1. The first 2.5 feet of each boring was field screened with a photoionization detector (PID). Each boring was completed to a depth of 5 feet below the highest PID reading, as measured in the top 2.5 feet. Soil borings were drilled using an all terrain vehicle (ATV) mounted drill rig with hollow stem augers and were continuously sampled using split spoon samplers. Drilling logs are included in Appendix A.

Subsurface soil samples were collected from the location of the highest PID reading and from the bottom of the boring. If no PID readings were recorded for a boring, a sample was collected from the bottom of the boring only. Soil samples were removed from the samplers with minimal disturbance and placed in laboratory-cleansed jars. Subsurface soil samples were analyzed for BTEX by EPA Method 8020 and PNAs by EPA Method 8310.

## 3.3 SAMPLE COLLECTION PROTOCOL

Personnel responsible for activities associated with collection of soil samples followed standard procedures to reduce the possibility of contamination and cross-contamination of the samples prior to delivery to the laboratory. Clean, decontaminated sampling equipment was used at each sampling location. Soil samples were placed in a cooler with ice and promptly delivered to the analytical laboratory using chain-of-custody procedures. All laboratory analyses were performed in accordance with EPA methodology by American Technical and Analytical Services, Inc., of Maryland Heights, Missouri. The laboratory results and chain-of-custody forms for surface soil samples are included in Appendix B.

# 4.0 CONTAMINANT OCCURRENCE

Fourteen surface and eight subsurface soil samples were collected and submitted for laboratory chemical analysis to delineate the approximate horizontal and vertical extent of soil impacted by petroleum hydrocarbons at the site. The analytical laboratory reports are contained in Appendix B.

## 4.1 SURFACE SOIL SAMPLES

Of the ten surface soil samples analyzed for BTEX constituents, all are below the Illinois EPA Tiered Approach to Cleanup Objectives(TACO) Tier 1, Table B Soil Cleanup Objectives for Industrial\Commercial Properties. Of the four composite samples collected for PNA analysis, all four are below the TACO Tier 1 values. The results of surface soil analyses are summarized in Table 1.

## 4.2 SUBSURFACE SOIL SAMPLES

Eight subsurface soil samples were collected and submitted for laboratory analysis of BTEX by EPA Method 8020 and PNAs by EPA Method 8310. All eight subsurface soil samples are below the TACO Tier 1 values for both BTEX constituents and PNAs. The results of subsurface soil analyses are summarized in Table 2.

* * * * *

## 5.0 CONCLUSIONS

- No free petroleum product was encountered during soil sampling.

- All surface soil samples are below the TACO Tier 1 values for BTEX and PNAs.

- All subsurface soil samples are below the TACO Tier 1 values for BTEX and PNAs.

* * * * *

# TABLE 1
## Summary of Surface Analytical Results
## Clark Refining & Marketing, Inc.
## Area F, Tank 200-1 Tank Yard
## Hartford, Illinois

| Sample Number: | | Detection | TACO | S-1 | S-2 | S-3 | S-4 | S-5 | S-6 | S-7 | S-8 | S-9 | S-1( |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Limits | Tier 1 CUO¹ | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/04/96 | 06/05/96 | 06/04/96 | 06/04/ |
| COMPOUND | | | | | | | | | | | | | |
| BTEX | | | | | | | | | | | | | |
| Benzene | µg/Kg | 1 | 20 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDI |
| Toluene | µg/Kg | 1 | 5,000 | 2 | 17 | 5 | 5 | 9 | 4 | 5 | BDL | BDL | 1 |
| Ethylbenzene | µg/Kg | 1 | 5,000 | BDL | 1 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDI |
| Xylenes (total) | µg/Kg | 1 | 74,000 | BDL | 8 | 1 | 3 | 6 | 3 | 4 | BDL | BDL | BDI |
| Total BTEX | µg/Kg | | | 2 | 26 | 6 | 8 | 15 | 7 | 9 | BDL | BDL | 1 |

| Sample Number: | | TACO | S-11 | | S-12 | | S-13 | | S-14 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO¹ | 06/04/96 | | 06/04/96 | | 06/04/96 | | 06/04/96 | |
| PNAs | | | DL | Result | DL | Result | DL | Result | DL | Result |
| Naphthalene | µg/Kg | 30,000 | 2,510 | BDL | 2,510 | BDL | 2,510 | BDL | 660 | BDL |
| Acenaphthylene | µg/Kg | NL | 2,510 | BDL | 2,510 | BDL | 2,510 | BDL | 660 | BDL |
| Acenaphthene | µg/Kg | 200,000 | 9,000 | BDL | 9,000 | BDL | 9,000 | BDL | 1,200 | BDL |
| Fluorene | µg/Kg | 160,000 | 1,050 | BDL | 1,050 | BDL | 1,050 | BDL | 140 | BDL |
| Phenanthrene | µg/Kg | NL | 660 | 1,220 | 660 | BDL | 660 | BDL | 850 | BDL |
| Anthracene | µg/Kg | 4,300,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Flouranthene | µg/Kg | 980,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Pyrene | µg/Kg | 1,400,000 | 251 | BDL | 251 | BDL | 251 | BDL | 180 | BDL |
| Benzo(a)anthracene | µg/Kg | 700 | 65.0 | 248 | 65.0 | 149 | 65.0 | 142 | 8.7 | 13.0 |
| Chrysene | µg/Kg | 1,000 | 375 | BDL | 375 | BDL | 375 | 545 | 100 | BDL |
| Benzo(b)flouranthene | µg/Kg | 4,000 | 25.5 | 169 | 25.5 | 77.3 | 25.5 | 75.5 | 12.0 | BDL |
| Benzo(k)flouranthene | µg/Kg | 4,000 | 12.5 | 52.1 | 12.5 | 27.8 | 12.5 | 27.2 | 11.0 | BDL |
| Benzo(a)pyrene | µg/Kg | 800 | 49.5 | 487 | 49.5 | 370 | 49.5 | 294 | 15.0 | 20.3 |
| Dibenzo(a,h)anthracene | µg/Kg | 800 | 150 | 680 | 150 | BDL | 150 | 261 | 20.0 | 83.6 |
| Benzo(g,h,l)perylene | µg/Kg | NL | 188 | 359 | 188 | BDL | 188 | 519 | 51.0 | BDL |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 8,000 | 125 | BDL | 125 | BDL | 125 | BDL | 29.0 | BDL |

¹ - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

µg/Kg - Microgram per kilogram

BDL - Below detection limit

PNAs - Polynuclear Aromatic Hydrocarbons analyzed by EPA Method SW846-8310

DL - Detection Limit

NL - Compound not listed in TACO Tier 1, Table B

# TABLE 2
## Summary of Subsurface Analytical Results
## Clark Refining & Marketing, Inc.
## Area F, Tank 200-1 Tank Yard
## Hartford, Illinois

| Sample Number: | | Detection | TACO | SB-1-5 | SB-2-5 | SB-3-5 | SB-4-5 | SB-5-5 | SB-6-5 | SB-7-5 | SB-8-5 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Limits | Tier 1 CUO[1] | 05/31/96 | 06/03/96 | 06/03/96 | 06/03/96 | 05/31/96 | 05/31/96 | 05/31/96 | 05/31/96 |
| COMPOUND | | | | | | | | | | | |
| BTEX | | | | | | | | | | | |
| **Benzene** | **µg/Kg** | **1** | **20** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| **Toluene** | **µg/Kg** | **1** | **5,000** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| **Ethylbenzene** | **µg/Kg** | **1** | **5,000** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| Xylenes (total) | µg/Kg | 1 | 74,000 | BDL | BDL | BDL | BDL | BDL | BDL | 2 | BDL |
| Total BTEX | µg/Kg | | | BDL | BDL | BDL | BDL | BDL | BDL | 2 | BDL |
| PNAs | | | | | | | | | | | |
| **Naphthalene** | **µg/Kg** | **660** | **30,000** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| **Acenaphthylene** | **µg/Kg** | **660** | **NL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| **Acenaphthene** | **µg/Kg** | **1200** | **200,000** | **BDL** | **BDL** | **BDL** | **BDL** | **3,540** | **BDL** | **BDL** | **BDL** |
| Fluorene | µg/Kg | 140 | 160,000 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Phenanthrene | µg/Kg | 660 | NL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Anthracene | µg/Kg | 660 | 4,300,000 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| **Flouranthene** | **µg/Kg** | **660** | **980,000** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| **Pyrene** | **µg/Kg** | **180** | **1,400,000** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| **Benzo(a)anthracene** | **µg/Kg** | **8.7** | **700** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| Chrysene | µg/Kg | 100 | 1,000 | BDL | BDL | BDL | BDL | 699 | BDL | BDL | BDL |
| Benzo(b)flouranthene | µg/Kg | 12.0 | 4000 | BDL | BDL | BDL | BDL | 48.4 | BDL | BDL | BDL |
| Benzo(k)flouranthene | µg/Kg | 11.0 | 4,000 | BDL | BDL | BDL | BDL | 20.7 | BDL | BDL | BDL |
| **Benzo(a)pyrene** | **µg/Kg** | **15.0** | **800** | **BDL** | **BDL** | **BDL** | **BDL** | **58.6** | **BDL** | **BDL** | **BDL** |
| **Dibenzo(a,h)anthracene** | **µg/Kg** | **20.0** | **800** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** |
| **Benzo(g,h,i)perylene** | **µg/Kg** | **51.0** | **NL** | **BDL** | **BDL** | **BDL** | **BDL** | **204** | **BDL** | **BDL** | **BDL** |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 29.0 | 8,000 | BDL | BDL | BDL | BDL | 140 | BDL | BDL | BDL |

[1] - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

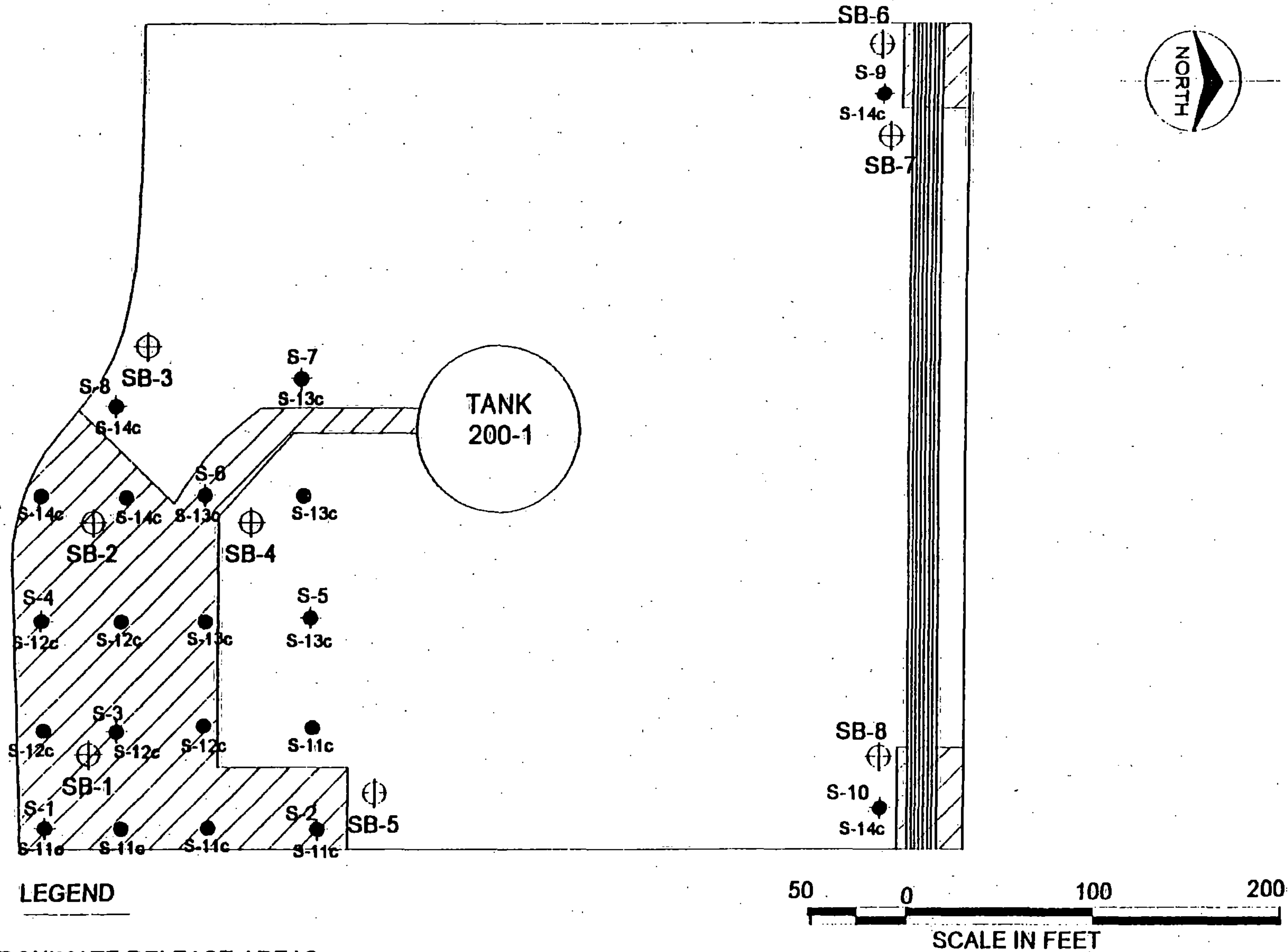
BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

µg/Kg - Microgram per kilogram

BDL - Below detection limit

PNAs - Polynuclear Aromatic Hydrocarbons analyzed by EPA Method SW846-8310

NL - Compound not listed in TACO Tier 1, Table A




LEGEND

- APPROXIMATE RELEASE AREAS

SB-3 SOIL BORING LOCATION

S-14c - SURFACE PNA SAMPLE ALIQUOT LOCATIONS

S-1 S-14c - SURFACE BTEX GRAB AND SURFACE PNA ALIQUOT SAMPLE LOCATIONS

| | |
|---|---|
| Burns & McDonnell Waste Consultants, Inc. | FIGURE 2<br>Sample Locations<br>Tank 200-1 Spill Areas<br>Release Nos. 942288, 941873, 942855, 951217<br>Clark Refining & Marketing, Inc. |

FILE

FILE NUMBER 070.50.01.08 080.58.47

RETAIN IN FILE UNTIL ______

CLARK

201 East Hawthorne
Hartford Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

November 10, 1997

Mr. Jim O'Brien, Manager
Office of Chemical Safety
Illinois Environmental Protection Agency
P.O. Box 19726
Springfield, IL 62794-9726

Re: Tiered Approach Objective Assessment

Dear Mr. O'Brien,

Enclosed is a copy of the Tiered Approach Objective assessment for the spill sites at the Hartford Refinery that was prepared by Burns & McDonnell. Clark Refining and Marketing, Inc. will provide your department with remediation techniques for two of the remaining sites in the near future.

Please call me at 618-254-7301, extension 218 with your questions.

Sincerely,

M. Modarres

Massood Modarres
Environmental Engineer

cc: John Sherrill
Tom Miller
File ✓

CLARK

Burns & McDonnell | Waste Consultants, Inc.

November 3, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery: IEPA Spill Nos. 940851, 941772, 942837, 941526, 930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this Tiered Approach to Cleanup Objectives (TACO) assessment of the above-listed spill sites at the Clark Hartford Refinery. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. In this letter report, the data compiled in the September 1996 report for each spill site is evaluated for compliance with TACO Tier I and Tier II cleanup objectives.

## SOIL SAMPLES

Soil sample analytical data for surface and subsurface samples is summarized in Tables 1 and 2, respectively. Tables 1 and 2 are condensed from the September 1996 report and list only the contaminants detected at each spill site in excess of TACO Tier I Cleanup Objectives for Industrial/Commercial properties. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. Spill areas are shown on a map of the refinery, included as Figure 1. Samples from areas that are not listed in the tables were all below the Industrial/Commercial cleanup objectives. TACO Tier 1 Exposure-Route Specific Values for Soils are summarized for the contaminants of concern in Table 3 for the Industrial/Commercial, Construction Worker, and Migration to Groundwater scenarios.

In addition to the soil sampling completed for the September 1996 report, soil samples were collected September 23, 1997 from four areas for analysis of organic carbon. Soil samples were collected from two locations each in Areas B, C, H, and J, and analyzed for

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Organic Matter using ASTM D2974-87 and for Total Organic Carbon using EPA SW-846. The samples were collected from below the contaminated zone at depths ranging from 7 to 12 feet below ground surface. Analytical data is presented in Table 4. Although both methods are approved for determination of the fraction of organic carbon ($f_{oc}$), the site-specific $f_{oc}$ values used for this assessment were calculated from the ASTM method of analyzing for organic matter. These values are also presented in Table 4.

**TIER II CLEANUP OBJECTIVES**

The site-specific $f_{oc}$ was evaluated for Areas B, C, H, and J so that site-specific cleanup objectives could be calculated for the Migration to Groundwater pathway. The TACO Tier I cleanup objectives given in TACO Appendix B, Table A for the Migration to Groundwater pathway are calculated for subsurface soil samples with a default $f_{oc}$ value of 0.002 gm/gm. Table 5 presents the site-specific cleanup objectives for the Migration to Groundwater pathway in addition to the surface and subsurface soil default objectives. The site-specific cleanup objectives were calculated using Equation S17 in TACO Appendix C, Table A. Default values for clay soil were used for density and porosity values.

To use calculated site-specific cleanup objectives, TACO specifies three additional concentration limits that cannot be exceeded for a site:

- the soil saturation limit for each chemical (calculated according to Section 742.220) cannot be exceeded,

- the soil attenuation capacity for each site (calculated according to Section 742.215) cannot be exceeded, and

- a weighted average of 1 (calculated according to Section 742.720) cannot be exceeded at each site for chemicals that target the same organ.

According to TACO Table E in Appendix A, the contaminants of concern to this study that target the same organ include only toluene and ethylbenzene, which both target the kidneys. These contaminants are present together above TACO Tier 1 Industrial/Commercial cleanup objectives for Area B only. Of the 8 samples listed in Table 1, the weighted average exceeds 1 for samples S-1 and S-13.

The soil attenuation capacity is represented by the organic carbon concentration in the soil at each site. The total concentration of all organic contaminants of concern at a site is

compared to the total organic material in the soil at that site. The total organic contaminant concentrations for all areas discussed in this assessment fall below the default organic matter concentration of 2000 milligrams per kilogram (mg/kg). (Please refer to the September 1996 report for complete soil analytical data.)

Soil saturation limits for benzene, toluene, ethylbenzene, and xylenes (BTEX) are given in TACO Appendix A, Table A. As indicated in the footnotes of Table 5, soil saturation limits are used as cleanup objectives when calculated objectives exceed the saturation limits.

**TIER II ASSESSMENTS**

In the following pages, each area is individually evaluated relative to the calculated TACO Tier II cleanup objectives presented in Table 5. All of the areas discussed in this assessment are areas that do not support full-time workers or structures. Clark personnel are present in the areas only intermittently and these areas are not generally accessible to the public. It is therefore reasonable at each of these sites that the construction worker scenario be used for the ingestion and inhalation cleanup objectives.

Each of the assessment pages in Attachment A addresses the status of a single area. The contaminants of concern (COCs) in both surface and subsurface soil are represented by the highest concentration for each in that area (refer to Tables 1 and 2 for complete soil sample information). In cases were detection limits exceed the cleanup objectives, non-detect samples are considered to be in excess of the cleanup objectives. The limiting scenario(s) for each area are determined by selecting the most conservative cleanup objectives from Table 5. The Tier II assessment for each area is then a direct comparison of the site data with the most conservative site-specific cleanup objectives.

**SUMMARY**

TACO assessment of each of the areas at the Clark Refinery, as shown in Attachment A, indicates that Areas A, E, F, G, and H are all below TACO Tier II cleanup objectives for the applicable contaminant pathway scenarios. These areas do not require further assessment or remediation.

Area B, surrounding Tank 35-2 in the tank yard, has surface and subsurface concentrations of BTEX constituents that exceed the TACO Tier II cleanup objectives. The cleanup objectives for this area include the calculated site-specific concentration for benzene (migration to groundwater pathway), and the construction worker scenario concentrations for TEX.

Area C, surrounding Tank 55-1 in the tank yard, has subsurface soil concentrations of benzene in two samples that exceed the Tier II cleanup objectives. The benzene cleanup objective for this area is a calculated site-specific concentration for the migration to groundwater pathway.

Area D, surrounding Tank 10-5 in the tank yard, has surface and subsurface soil concentrations of benzene that exceed Tier II cleanup objectives. The benzene cleanup objectives for this area are the generic TACO Tier I values, migration to groundwater pathway, for surface and subsurface soil.

Area J, along Illinois Route 3, has two subsurface soil samples in excess of the Tier II cleanup objectives for benzene, and one subsurface soil sample in excess of the Tier II cleanup objectives for benzo(b)fluoranthene and dibenzo(a,h)anthracene. The cleanup objectives for this area are calculated site-specific concentrations, migration to groundwater pathway, for these three contaminants.

If you have any questions concerning this assessment, please contact me at (314) 305-0077, ext. 226.

Sincerely,

Paul Christian

Paul Christian
Project Manager

attachment

# Table 1
## Tier II Surface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area A | | Area B | | | | | | | | Area C | Area D | | Area E | Area J | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S-5 | S-6 | S-1 | S-3 | S-6 | S-8 | S-9 | S-10 | S-13 | S-14 | S-8 | S-2 | S-4 | S-13 | SB-5S | SB-6S |
| Benzene | -- | -- | 6.6 | 3.9 | 0.036 | 2.4 | 12 | 0.28 | 53 | 0.1 | -- | 0.27 | 3.1 | -- | -- | -- |
| Toluene | -- | -- | 69 | -- | -- | -- | 53 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | 38 | -- | -- | -- | 19 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | >75 | 110 | -- | 90 | >75 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | 1.21 | 0.851 | -- | -- | -- | -- | -- | -- | -- | -- | 2.90 | -- | -- | 1.26 | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | 1.03 | 2.25 | -- | -- | -- | -- | -- | -- | -- | -- | 4.28 | -- | -- | -- | 2.10 | 1.16 |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 2
## Tier II Subsurface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area B | | | | | | | | | Area C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-1 | SB1-5 | SB2-2 | SB3-2 | SB3-7 | SB4-2 | SB4-7 | SB5-5 | SB7-5 | SB1-2 | SB1-7 | SB3-2.5 | SB3-7.5 |
| Benzene | 3.2 | <1.25 | <1.25 | 12.7 | 0.33 | <1.25 | 0.052 | <0.125 | 0.38 | 0.17 | -- | 0.27 | 1.5 |
| Toluene | 15 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | 16 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | >75 | -- | -- | >75 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.971 | -- | -- |

| | Area D | | | | | | | | Area H | Area J | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-2 | SB1-7 | SB2-1 | SB2-6 | SB3-1 | SB3-6 | SB4-2 | SB4-7 | SB1-2 | SB1-8 | SB1-13 | SB3-8 | SB3-13 |
| Benzene | 0.16 | 4 | 0.24 | 0.87 | 0.13 | 0.21 | 0.11 | 2.6 | 0.059 | 0.034 | -- | <0.125 | 0.2 |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.94 | -- | 4.09 | 3.93 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 23.30 | -- | -- | 5.65 |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.9 | 1.28 | 1.92 | 1.78 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 238 | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 18.2 | 2.37 | 3.97 | [illegible] |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 3
## Exposure-Route Specific Values for Soils
## Illinois Tiered Approach to Cleanup Objectives

| | Industrial/Commercial | | Construction Worker | | Migration to Groundwater |
|---|---|---|---|---|---|
| | Ingestion | Inhalation | Ingestion | Inhalation | |
| Benzene | 200 | 1.5 | 4,300 | 2.1 | 0.03 |
| Toluene | 410,000 | 650 | 410,000 | 42 | 12 |
| Ethylbenzene | 200,000 | 400 | 20,000 | 58 | 13 |
| Xylenes | 1,000,000 | 410 | 410,000 | 410 | 150 |
| Benzo(a)anthracene | 8 | – | 170 | – | 2 |
| Benzo(b)fluoranthene | 8 | – | 170 | – | 5 |
| Benzo(a)pyrene | 0.8 | – | 17 | – | 8 |
| Chrysene | 780 | – | 17,000 | – | 160 |
| Dibenzo(a,h)anthracene | 0.8 | – | 17 | – | 2 |

* All sample data reported in milligrams per kilogram (mg/kg)

**All information reproduced from Title 35, Subtitle G, Chapter I, Subchapter f, Part 742, Appendix B, Table B

# Table 4
## Summary of Fraction Organic Carbon Analysis
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| Sample Location & Number | Sample Date | Organic Matter ASTM D2974-87 | Tot. Organic Carbon EPA SW-846 | Average Fraction Organic Carbon[1] |
|---|---|---|---|---|
| Area B - 1 | 09/23/97 | 15,000 | 830 | |
| Area B - 2 | 09/23/97 | 13,900 | 5952 | 0.0145 |
| Area C - 1 | 09/23/97 | 10,800 | 5353 | |
| Area C - 2 | 09/23/97 | 14,800 | 1107 | 0.0128 |
| Area H - 1 | 09/23/97 | 14,600 | 2288 | |
| Area H - 2 | 09/23/97 | 2,570 | 5371 | 0.0089 |
| Area J -1 | 09/23/97 | 7,800 | 2578 | |
| Area J - 2 | 09/23/97 | 2,300 | 2411 | 0.0051 |

* All sample data reported in milligrams per kilogram (mg/kg)

[1] = Average is calculated using ASTM Method data only.

# Table 5
## Tier II Cleanup Objectives - Soil
## Industrial/Residential Scenario
## Migration to Groundwater Pathway
## Illinois Tiered Approach to Cleanup Objectives

| | TACO Generic Cleanup Objectives | | Site Specific Cleanup Objectives | | | |
|---|---|---|---|---|---|---|
| | Surface | Subsurface | Area B | Area C | Area H | Area J |
| | (foc =0.006) | (foc = 0.002) | (foc = 0.015) | (foc = 0.013) | (foc = 0.009) | (foc = 0.005) |
| Benzene | 0.09 | 0.03 | 0.225 | 0.195 | 0.135 | 0.075 |
| Toluene | 36 | 12 | 90 | 78 | 54 | 30 |
| Ethylbenzene | 39 | 13 | 97.5 | 84.5 | 58.5 | 32.5 |
| Xylenes | 410** | 150 | 410** | 410** | 410** | 375 |
| Benzo(a)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |
| Benzo(b)fluoranthene | 15 | 5 | 37.5 | 32.5 | 22.5 | 12.5 |
| Benzo(a)pyrene | 24 | 8 | 60 | 52 | 36 | 20 |
| Chrysene | 480 | 160 | 1,200 | 1,040 | 720 | 400 |
| Dibenzo(a,h)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |

* All sample data reported in milligrams per kilogram (mg/kg)

** Cleanup Objective calculations are limited by the soil saturation concentration (410 mg/kg)

## ATTACHMENT A

TACO Tier II Assessment Sheets

LOCATION: Area A - NW of Biological Treatment Unit

MEDIA: Soil

CLASSIFICATION: ~~Industrial/Commercial with no full time~~ workers and no structures. Use Construction Worker scenario.

| | | |
|---|---|---|
| COCs - SURFACE: | Benzo(a)pyrene | 1.21 mg/kg |
| | Dibenzo(a,h)anthracene | 2.25 mg/kg |

COCs - SUBSURFACE: N/A

LIMITING SCENARIO: Migration to Groundwater (generic surface):

| | |
|---|---|
| Benzo(a)pyrene | 24 mg/kg |
| Dibenzo(a,h)anthracene | 6 mg/kg |

TIER II ASSESSMENT:

Surface soil concentrations of both benzo(a)pyrene and dibenzo(a,h)anthracene are below the cleanup objectives for both the construction worker scenario and the migration to groundwater scenario.

| | | |
|---|---|---|
| LOCATION: | Area B - Tank 35-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial Commercial with no full time workers and no structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 53 mg/kg |
| | Toluene | >75 mg/kg |
| | Ethylbenzene | >75 mg/kg |
| | Xylenes | >75 mg/kg |
| COCs - SUBSURFACE: | Benzene | 3.2 mg/kg |
| | Toluene | 15 mg/kg |
| | Ethylbenzene | 16 mg/kg |
| | Xylenes | >75 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.225 mg/kg |
| | Construction Worker: | |
| | Toluene | 47 mg/kg |
| | Ethylbenzene | 58 mg/kg |
| | Xylenes | 410 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-1, S-3, S-8, S-9, S-10, and S-13 are in excess of the limiting scenario cleanup objective for benzene; surface soil samples S-1, S-9, and S-13 exceed the objective for toluene; surface soil sample S-13 exceeds the ethylbenzene objective, and surface soil samples S-1, S-9, and S-13 exceed the xylenes cleanup objective. In addition, the weighted average of toluene and ethylbenzene concentrations exceed 1 for soil samples S-1 and S-13.

Subsurface soil samples SB1-1, SB1-5, SB2-2, SB3-2, SB3-7, SB4-2, and SB7-5 are in excess of limiting scenario cleanup objectives for benzene. Subusurface soil samples SB1-1 and SB3-2 are potentially in excess of the cleanup objective for xylenes.

| | | |
|---|---|---|
| LOCATION: | Area C - Tank 55-1 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full-time workers or structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 2.90 mg/kg |
| | Dibenzo(a,h)anthracene | 4.28 mg/kg |
| COCs - SUBSURFACE: | Benzene | 1.5 mg/kg |
| | Dibenzo(a,h)anthracene | 0.971 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.195 mg/kg |
| | Dibenzo(a,h)anthracene | 13 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below cleanup objectives for both the construction worker scenario (Table 3) and the site-specific migration to groundwater scenario (Table 5).

Subsurface soil samples SB3-2.5 and SB3-7.5 are in excess of the migration to groundwater scenario benzene cleanup objective. All subsurface soil samples are below cleanup objectives for dibenzo(a,h)anthracene.

LOCATION: Area D - Tank 10-5

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full-time workers and no structures. Use construction worker scenario.

| | | |
|---|---|---|
| COCs - SURFACE: | Benzene | 3.1 mg/kg |
| COCs - SUBSURFACE: | Benzene | 4.0 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (generic): | |
| | Benzene (surface) | 0.09 mg/kg |
| | Benzene (subsurface) | 0.03 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-2 and S-4 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

Subsurface soil samples SB1-2, SB1-7, SB2-1, SB2-6, SB3-1, SB3-6, SB4-2, and SB4-7 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

| | |
|---|---|
| LOCATION: | Area E - Tank 120-2 |
| MEDIA: | Soil |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. |
| COCs - SURFACE: | Benzo(a)pyrene 1.25 mg/kg |
| COCs - SUBSURFACE: | NA |
| LIMITING SCENARIO: | Construction Worker:<br>Benzo(a)pyrene 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario for benzo(a)pyrene.

All subsurface soil samples are below all cleanup objectives for both the construction worker and migration to groundwater scenarios.

LOCATION: Area F - Tank 200-1

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

All surface and subsurface soil samples are below all applicable cleanup objectives.

LOCATION: Area G - Sulfuric Acid Spill Area

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

Surface soil samples were analyzed for pH and found to be within the normal limits for soil acidity.

| | |
|---|---|
| LOCATION: | Area H - Hawthorne |
| MEDIA: | Soil |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. |
| COCs - SURFACE: | NA |
| COCs - SUBSURFACE: | Benzene 0.059 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): Benzene 0.135 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below all applicable TACO Tier I cleanup objectives.

All subsurface soil samples are below the site-specific migration to groundwater cleanup objective calculated for benzene.

| | | |
|---|---|---|
| LOCATION: | Area J - Route 3 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Dibenzo(a,h)anthracene | 2.10 mg/kg |
| COCs - SUBSURFACE: | Benzene | 0.20 mg/kg |
| | Benzo(a)anthracene | 4.94 mg/kg |
| | Benzo(b)fluoranthene | 23.3 mg/kg |
| | Benzo(a)pyrene | 9.9 mg/kg |
| | Chrysene | 238 mg/kg |
| | Dibenzo(a,h)anthracene | 18.2 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.075 mg/kg |
| | Benzo(a)anthracene | 5 mg/kg |
| | Benzo(b)fluoranthene | 12.5 mg/kg |
| | Chrysene | 400 mg/kg |
| | Dibenzo(a,h)anthracene | 5 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario and the site-specific migration to groundwater scenario.

Subsurface soil samples SB3-8 and SB3-13 are in excess of the site-specific migration to groundwater cleanup objectives for benzene. Subsurface soil sample SB1-8 is in excess of the migration to groundwater cleanup objectives for both benzo(b)fluoranthene and dibenzo(a,h)anthracene.

Clayton
GROUP SERVICES

# APPENDIX P-8

## AREA C TANK 55-1 SPILL AREA
## IEMA INCIDENT 942837

# OFFICE OF THE ATTORNEY GENERAL
STATE OF ILLINOIS

March 11, 1996

Jim Ryan
ATTORNEY GENERAL

Pat Sharkey
Mayer, Brown and Platt
190 South LaSalle Street
Chicago, IL 60603-3441

RE: Clark Hartford / Spill Sampling Plan Revision Approvals

Dear Ms. Sharkey:

I am writing to confirm the Agency's acceptance of the plan for sampling that was discussed at a meeting held on February 27, 1996 between representatives of the State and Clark. Initially, Burns & McDonnell had prepared a Sampling and Analysis Plan for Areas B, C, D, F, H, and J. In my letter dated January 16, 1996, to you we proposed additional sampling in Areas A, E, and G as well as groundwater sampling in Areas K and L. At the February 27, 1996, meeting, representatives of Clark presented the State with a two page table of proposals for sampling at the various areas in response to the issues raised in my letter. Further discussions at that meeting resulted in an apparent agreement regarding a sampling plan acceptable to all parties. Following are the specifics of that plan as it is understood by the Illinois EPA representatives.

| | |
|---|---|
| Area A -- representing spill #940851<br><br>Asphalt spill<br><br>Northwest of Bio Unit | Surface samples (one foot below post-cleanup fill interface)<br><br><u>VOC: 4 samples for BTEX</u><br><br><u>PNAs: 3 samples for analysis:</u> One from S-1, a composite of S-2 and S-3, and one from S-4. S-1 and S-4 are intended to be collected just outside the previously remediated area to the south and north respectively. |

| | |
|---|---|
| **Area B -- representing spill #941772**<br><br>Gasoline spill from mixer failure at Tank 35-2<br><br>**Tank Area 35-1 & -2** | **Surface samples (6" to 12" depth)**<br><br><u>VOC: 7 samples for BTEX</u> (SB-1 thru SB-5 as proposed, and two more north and south of SB-3 in line with SB-2, SB-5 and SB-1, SB-4 respectively)<br><br>**Subsurface samples** (two samples each, collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br><u>VOC: 5 borings each for BTEX</u> (at proposed SB-1 thru SB-5) |
| **Area B -- representing spill #941772**<br><br>Gasoline spill from mixer failure at Tank 35-2 5<br><br>**Tank Area 35-3** | **Surface samples (6" to 12" depth)**<br><br><u>VOC: 7 samples for BTEX</u> (5 samples in area affected in east ½ of Tank Area and 2 samples from that part not apparently impacted within the tank dike area)<br><br>**Subsurface samples** (two samples each ,collected from the highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br><u>VOC: 2 borings for BTEX</u> (both in area affected in East ½ of Tank Area) |
| **Area B -- representing spill #941772**<br><br>Gasoline spill from mixer failure at Tank 35-2<br><br>**Tank Area 55-1** | Consolidated with requirements for Area C, since same tank farm affected. |
| **Area C -- representing spills #942837 and #941772**<br><br>Gasoil overfill of Tank 55-1 and overflow of gasoline spill from drainage from Tank Area mixer failure at Tank 35-2<br><br>**Tank Area 55-1** | **Surface samples (6" to 12" depth)**<br><br><u>VOC: 7 samples for BTEX</u> (4 at SB-1 thru SB-4 and three others: one located between SB-3 and SB-4, one collected between the pipe rack and tank 55-1 adjacent to the easternmost aspect of that tank, and one collected between SB-1 and SB-2)<br><br><u>PNAs: 4 composite samples</u>, each of 5 discrete sampling points, as indicated in proposal diagram.<br><br>**Subsurface samples** (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br><u>BTEX and PNAs: 4 borings</u> (at SB-1 thru SB-4 as indicated in the proposal diagram) |

| | |
|---|---|
| **Area D – representing spill #941526**<br><br>**Naphtha and toluene**<br><br>**Tank Area 10-5** | **Surface samples (6" to 12" depth)**<br><br>VOC: 4 samples for BTEX and Naphthalene (2 at five to ten feet on either side [east & west] of SB-3 and 2 more collected between east-center of tank and dike wall)<br><br>Subsurface samples ( two samples collected from each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring)<br><br>VOC: 4 borings for BTEX and Naphthalene ( at SB-1 thru SB-4 as proposed) |
| **Area E – representing spill #930211**<br><br>**Crude oil**<br><br>**Tank Area 120-2** | **Surface samples (6" to 12" depth)**<br><br>VOC: 10 samples for BTEX ( at SB-1 thru SB-10)<br><br>PNAs: 4 composite samples, each of 5 discrete sampling points as indicated in proposal diagram.<br><br>Subsurface samples (one sample each boring at highest PID reading )<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram) |
| **Area F – representing spills #942288, #941873, #942855, and #951217**<br><br>**Crude oil and gasoline**<br><br>**Tank Area 200-1** | **Surface samples (6" to 12" depth)**<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 8 borings (at SB-1 thru SB-8 as indicated in the proposal diagram). |
| **Area G – representing spill #931160**<br><br>**Sulfuric acid**<br><br>**Cooling Tower #5 Area** | **Surface samples (0-12")**<br><br>pH: 4 composite samples (each of 5 discrete sampling points as indicated in proposal diagram). |

| | |
|---|---|
| Area H -- representing spill #941913, #942188<br><br>Gasoil<br><br>Area adjacent to Hawthorn Avenue where feed supply lines cross to connect with Tank 120-7 | Surface samples (6" to 12" depth)<br><br>VOC: 10 samples for BTEX (as indicated in proposal diagram)<br><br>PNAs: 4 composite samples (of 5 discrete sampling points each as indicated in proposal diagram).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 10 borings (at SB-1 thru SB-10 as indicated in the proposal diagram). |
| Area J -- representing spill #942432 | Surface samples (6" to 12" depth)<br><br>VOC: 4 samples for BTEX ( only SB-1 thru SB-4 as indicated in proposal diagram)<br><br>PNAs: 2 composite samples (of 2 discrete sampling points each as indicated in proposal diagram, SB-1 thru SB-4).<br><br>Subsurface samples (two samples each boring, at highest PID reading, and at 5 foot depth or groundwater interface for each boring).<br><br>BTEX and PNAs: 6 borings (at SB-1 thru SB-6 as indicated in the proposal diagram). |

As for Area K (representing spill #940515 (asphalt)) and Area L (representing Spills #941701, #950726 and #950893 (gasoil, fuel oil and petroleum leaching)), the Agency has received and reviewed the "Field Investigation Workplan for Groundwater Sampling at Clark Refining and Marketing, Inc. Black Oil River Line Release area" dated June 1995 pertaining to Area K and the "Site Assessment Report - Hartford River Terminal for Clark Refining and Marketing, Inc. Hartford, Illinois" dated December 1995 pertaining to Area L. Pursuant to Clark's proposed field investigation workplan and site assessment report for sites "K" and "L", the Agency requests that the wells from each of these sites be sampled and monitored for at least three years. The sampling and monitoring frequency for the first year shall be on a quarterly basis, the second year on a semi-annual basis, and annually thereafter. Sampling shall continue until three consecutive sets of sample data show levels below groundwater quality standards or groundwater cleanup objectives approved by the Agency. The sample parameters proposed by Clark's consultant are acceptable.

In addition, soil boring and sampling results from Area L taken from the December 1995 site assessment report have indicated that volatile samples from selected soil borings are in excess of the TACO Class I soil cleanup objectives. Clark shall provide the Agency with a workplan to address these soils at Area L (River Terminal Location).

The agreed schedule is that Clark shall send final plans for Agency approval two weeks after receipt of this letter. The Agency shall in one week following its receipt of the plans. The plans should be sent to Jim O'Brien with a copy to me. If you have any questions, please do not hesitate to call.

Very truly yours,

James L Morgan

James L. Morgan
Senior Assistant Attorney General
Environmental Bureau, Springfield

enc.

pc: Jim O'Brien

John Waligore

JLM:jm

11905 0002
Clark Oil
SF/Tech

CLARK

REFINING & MARKETING, INC.

201 East Hawthorne
Hartford, Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

Source: IEPA BOL

April 7, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Division of Environmental Programs
Illinois Environmental Protection Agency
2200 Churchill Road, P.O. Box 19276
Springfield, IL 62794

Re: State vs. Clark, PCB 95-163

Dear Mr. O'Brien,

Please find attached a copy of the Burns & McDonnell Waste Consultants, Inc. report entitled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery dated April 1997. This report summarizes the field sampling activities and analytical results for Areas A through H, and Area J at the Clark Hartford Refinery. Field activities were conducted in accordance with the sampling and analysis plans approved by the Illinois EPA.

The preliminary findings show that Clark's remediation efforts have been successful. Selected areas may require further evaluation. We believe the remediation goals should take into account the former and future industrial use of the sites and the minimal risk of exposure to the public. If you have any questions, feel free to contact Bill Irwin at (618) 254-7301 ext. 266.

Sincerely,

Forrest B. Lauher
Refinery Manager

Enclosure

cc: John Sherrill
Tom Powell
Tom Miller

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Source: IEPA BOL

# SUMMARY REPORT: SURFACE AND SUBSURFACE INVESTIGATIONS OF SPILLS AT THE CLARK HARTFORD REFINERY FOR CLARK REFINING AND MARKETING, INC. HARTFORD REFINERY HARTFORD, ILLINOIS

SEPTEMBER 1996

**Project No. 94-155-4-056**



**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

# TABLE OF CONTENTS

# INTRODUCTION

This report presents the results of nine separate surface and subsurface investigations associated with reported spills at the Clark Refining and Marketing, Inc.'s (Clark) Hartford, Illinois Refinery. These spills occurred between December 6, 1991 and July 7, 1995 at or near the Hartford Refinery. Clark's Hartford Refinery is located in Hartford, Illinois, approximately 10 miles north of St. Louis, Missouri.

The site investigation reports included herein present data obtained as a result of soil sample collection and analysis conducted as part of Clark's efforts to investigate areas impacted by these documented releases. Soil sampling and analysis at each site was conducted according to the site specific Sampling and Analysis Plan generated by Burns & McDonnell Waste Consultants, Inc. (BMWCI) and approved by the Illinois Environmental Protection Agency. BMWCI personnel provided oversight of all field activities described in the following reports.

# SITE INVESTIGATION REPORT
# FOR
# AREA C
# TANK 55-1 SPILL AREA
# ILLINOIS EPA SPILL NO. 942837
# CLARK REFINING AND MARKETING, INC.
# HARTFORD, ILLINOIS

**AUGUST 1996**

**94-155-4-056**

**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

## TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 GENERAL

The following describes the site investigation activities used to further characterize the condition of the Tank 55-1 diked area (Site) for Clark Refining & Marketing, Inc. (Clark) in Hartford, Illinois. The results of this characterization were used, in addition to previous surface sampling conducted in October, 1995, to determine the approximate vertical and horizontal extent of subsurface contamination at the Site due to this release (Illinois Environmental Protection Agency Spill #942837). This site investigation report provides: site geology and hydrology, a description of the field work performed; methods, procedures, and analyses used; chemical analytical data; and a summary of contaminant occurance. The location of the Site is illustrated on Figure 1.

## 1.2 SITE HISTORY AND DESCRIPTION

On December 16, 1994, Clark had a release of approximately 40 barrels of gasoil due to overfill of Tank 55-1. The release was contained within the diked area around Tanks 80-9 and 55-1. Clark personnel used vacuum trucks to recover the product and water from the diked area. Approximately 1,675 gallons of liquid was recovered. Clark initiated a modified biological augmentation program to remediate the soil by applying activated sludge from the aggressive biological wastewater treatment process. Clark collected a composite soil sample on June 5, 1995.

On July 3, 1995, Clark began excavating soil surrounding Tank 55-1. Between July 3 and July 10, 1995, nineteen roll off containers were loaded with soil. Between September 6 and September 7, 1995, an additional fourteen roll off containers were loaded with soil from the ditch areas surrounding Tank 55-1. Approximately 400 cubic yards of soil was disposed of at Laidlaw Landfill in Roxana, Illinois. Clark resampled the area on October 13, 1995 by collecting grab samples from the locations previously sampled for the composite. Samples were analyzed for BTEX and PNAs. A more detailed description of the previous sampling activities and the laboratory results is contained in the Burns & McDonnell Waste Consultants, Inc. (BMWCI) report <u>Summary Report of Spills at the Clark Hartford Refinery for Clark Refining and Marketing, Inc.</u> of November 1995. The Site is depicted in Figure 2.

* * * * *

# 2.0 HYDROGEOLOGY

## 2.1 REGIONAL HYDROGEOLOGY

The Site lies within the Alluvial Valleys Region as defined in United States Geological Survey Water-Supply Paper 2242, 1984. The Alluvial Valleys Region is commonly underlain by sand and gravel as well as silt and clay. The surficial deposit of sand and gravel is commonly underlain by interbedded silt and clay in turn underlain by a basal layer of sand and gravel. Locally, these units are collectively known as Cahokia Alluvium. The subsurface material in the Site area consists of Quarternary Alluvium, which is made up of modern river floodplain deposits of poorly-sorted sands, silts, and clays with some sandy gravel. The alluvium ranges in thickness from 50 to 200 feet below the ground surface (bgs).

The sequence of deposits in the Alluvial Valleys Region is dependant on the depositional history. The sands and gravels in the valleys of major streams, such as the Mississippi River, are commonly overlain by deposits of clay and other fine-grained alluvium deposited during floods following the end of the glacial period.

The alluvial deposits are recharged by precipitation on the valleys, groundwater moving from the adjacent and underlying aquifers, and overbank flooding of the streams. Water in the alluvial deposits discharges to the streams in the valleys.

The underlying bedrock in the Hartford area is composed of Mississippian age interbedded limestones, sandstones, and shales of the Lower Chesterian Series. Regionally, these units dip east toward the center of the Illinois Basin. The Illinois Basin is the major geologic structure in the region.

## 2.2 LOCAL HYDROGEOLOGY

Soil borings were completed to a maximum of 7.5 feet below ground surface (bgs) at this location. Sediments encountered during drilling included mainly greenish to dark grey silty clays with some shallow brown topsoil. Groundwater was not encountered during drilling. Soil borings are included as Appendix A.

* * * * *

## 3.0 FIELD INVESTIGATION ACTIVITIES

To determine the approximate vertical and horizontal extent of petroleum hydrocarbons at the Site, eleven surface soil samples were collected and four soil borings were drilled and sampled. The sampling locations were concentrated around Tank 55-1 and are shown on Figure 2.

### 3.1 SURFACE SOIL SAMPLE COLLECTION

To determine the presence of surface contaminants in the vicinity of the release, seven surface soil samples were collected and analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX) by United States Environmental Protection Agency (EPA) Method 8020 and four surface soil composites (consisting of five aliquots each) were collected and analyzed for Polynuclear Aromatic Hydrocarbons (PNAs) by EPA Method 8310. Surface soil samples were collected at a depth of 6 inches below ground surface to insure sampling of native soil. Surface soil samples from soil boring locations were collected prior to completion of the borings with a drill rig. Soil samples were placed in laboratory-cleansed jars after collection.

### 3.2 DRILLING AND SUBSURFACE SOIL SAMPLE COLLECTION

Four soil borings were drilled in the vicinities of Tank 55-1. The first 2.5 feet of each boring was field screened with a photoionization detector (PID). Each boring was completed to a depth of 5 feet below the highest PID reading measured in the top 2.5 feet. Soil borings were drilled using an all terrain vehicle (ATV) mounted drill rig with hollow stem augers and were continuously sampled using split spoon samplers. Drilling logs are included in Appendix A.

Subsurface soil samples were collected from the location of the highest PID reading and from the bottom of the boring. In borings with no elevated PID readings, samples were collected from the bottom of the boring only. Soil samples were removed from the samplers with minimal disturbance and placed in laboratory-cleansed jars. Subsurface soil samples were analyzed for BTEX by EPA Method 8020 and PNAs by EPA Method 8310.

### 3.3 SAMPLE COLLECTION PROTOCOL

Personnel responsible for activities associated with collection of soil samples followed standard procedures to reduce the possibility of contamination and cross-contamination of the samples prior to delivery to the laboratory. Clean, decontaminated sampling equipment was used at each sampling location. Soil samples were placed in a cooler with ice and promptly delivered to the analytical laboratory using chain-of-custody procedures. All laboratory analyses were performed in accordance with EPA methodology by American

Technical and Analytical Services, Inc., of Maryland Heights, Missouri. The laboratory results and chain-of-custody forms for surface soil samples are included in Appendix B.

* * * * *

## 4.0 CONTAMINANT OCCURRENCE

Eleven surface and six subsurface soil samples were collected and submitted for laboratory chemical analysis to delineate the approximate horizontal and vertical extent of soil impacted by petroleum hydrocarbons at the site. The analytical laboratory reports are contained in Appendix B.

### 4.1 SURFACE SOIL SAMPLES

Of the seven surface soil samples analyzed for BTEX, all are below the Illinois EPA Tiered Approach to Cleanup Objectives(TACO) Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties. Of the four composite surface samples collected for analysis of PNAs, soil samples S-8 and S-10 exceed the TACO Tier 1 values for at least one PNA. The results of surface soil sample analyses are summarized in Table 1.

### 4.2 SUBSURFACE SOIL SAMPLES

Six subsurface soil samples were collected and submitted for laboratory analysis of BTEX by EPA Method 8020 and for PNAs by EPA Method 8310. Soil samples SB-1-2, SB-3-2.5, and SB-3-7.5 all exceed TACO Tier 1 values for benzene. Soil samples SB-1-7, SB-2-5 and SB-3-7.5 all exceed TACO Tier 1 values for at least one PNA. Soil sample SB-4-5 is below TACO Tier 1 values for all BTEX constituents and PNAs. The results of subsurface soil sample analyses are summarized in Table 2.

* * * * *

## 5.0 CONCLUSIONS

- No free petroleum product was encountered during soil sampling.
- Surface soil samples S-8 and S-10 exceed TACO Tier 1 values for PNAs.
- Subsurface soil samples SB-1-2, SB-3-2.5, and SB-3-7.5 all exceed TACO Tier 1 values for benzene.
- Subsurface soil samples SB-1-7, SB-2-5 and SB-3-7.5 all exceed TACO Tier 1 values for at least one PNA.
- Soil Boring SB-2 is located outside the spill area. The presence of elevated levels of PNAs at a 5 foot depth may be due to historic contamination.
- The increasing levels of petroleum hydrocarbons corresponding to increasing depth in Soil Boring SB-3 may be due to historic contamination.

* * * * *

# TABLE 1
## Summary of Surface Analytical Results
## Clark Refining & Marketing, Inc.
## Area C, Tank 55-1 Tank Yard
## Hartford, Illinois

| Sample Number: | | Detection | TACO | S-1 | S-2 | S-3 | S-4 | S-5 | S-6 | S-7 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Limits | Tier 1 CUO¹ | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 |
| COMPOUND | | | | | | | | | | |
| BTEX | | | | | | | | | | |
| **Benzene** | **µg/Kg** | **1** | **20** | **11** | **BDL** | **BDL** | **BDL** | **BDL** | **12** | **BDL** |
| **Toluene** | **µg/Kg** | **1** | **5,000** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **5** | **3** |
| **Ethylbenzene** | **µg/Kg** | **1** | **5,000** | **BDL** | **BDL** | **BDL** | **BDL** | **BDL** | **2** | **BDL** |
| Xylenes (total) | µg/Kg | 1 | 74,000 | BDL | BDL | BDL | BDL | BDL | 11 | BDL |
| Total BTEX | µg/Kg | | | 11 | BDL | BDL | BDL | BDL | 30 | 3 |

| Sample Number: | | TACO | S-8 | | S-9 | | S-10 | | S-11 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO¹ | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/05/96 | |
| PNAs | | | DL | Result | DL | Result | DL | Result | DL | Result |
| **Naphthalene** | **µg/Kg** | **30,000** | **2,510** | **BDL** | **660** | **BDL** | **660** | **3,250** | **2,510** | **BDL** |
| **Acenaphthylene** | **µg/Kg** | **NL** | **2,510** | **BDL** | **660** | **BDL** | **660** | **4,390** | **2,510** | **BDL** |
| **Acenaphthene** | **µg/Kg** | **200,000** | **9,000** | **BDL** | **1,200** | **BDL** | **1,200** | **BDL** | **9,000** | **BDL** |
| Fluorene | µg/Kg | 160,000 | 1,050 | BDL | 140 | BDL | 3,500 | 6,040 | 1,050 | BDL |
| Phenanthrene | µg/Kg | NL | 660 | BDL | 660 | BDL | 850 | 5,770 | 660 | 1,020 |
| Anthracene | µg/Kg | 4,300,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| **Flouranthene** | **µg/Kg** | **980,000** | **660** | **BDL** | **660** | **BDL** | **660** | **3,630** | **660** | **BDL** |
| **Pyrene** | **µg/Kg** | **1,400,000** | **251** | **BDL** | **180** | **BDL** | **835** | **3,560** | **251** | **599** |
| **Benzo(a)anthracene** | **µg/Kg** | **700** | **65.0** | **395** | **8.7** | **BDL** | **217** | **1,260*** | **65.0** | **203** |
| Chrysene | µg/Kg | 1,000 | 375 | 5,920* | 100 | BDL | 1,250 | 41,700* | 375 | BDL |
| Benzo(b)flouranthene | µg/Kg | 4,000 | 25.5 | 865 | 12.0 | 40.4 | 85.0 | 2,040 | 25.5 | 631 |
| Benzo(k)flouranthene | µg/Kg | 4,000 | 12.5 | 455 | 11.0 | 106 | 41.5 | 813 | 12.5 | 102 |
| **Benzo(a)pyrene** | **µg/Kg** | **800** | **198** | **2,900*** | **15.0** | **92.6** | **165** | **757** | **49.5** | **496** |
| **Dibenzo(a,h)anthracene** | **µg/Kg** | **800** | **150** | **4,280*** | **20.0** | **534** | **20.0** | **152** | **150** | **421** |
| **Benzo(g,h,i)perylene** | **µg/Kg** | **NL** | **188** | **3,030** | **51.0** | **BDL** | **51.0** | **179** | **188** | **BDL** |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 8,000 | 125 | 2,940 | 29.0 | BDL | 29.0 | 304 | 125 | 526 |

¹ - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

DL - Detection Limit

µg/Kg - Microgram per kilogram

PNAs - Polynuclear Aromatic Hydrocarbons

BDL - Below detection limit

NL - Compound not listed in TACO Tier 1, Table B

488* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwate

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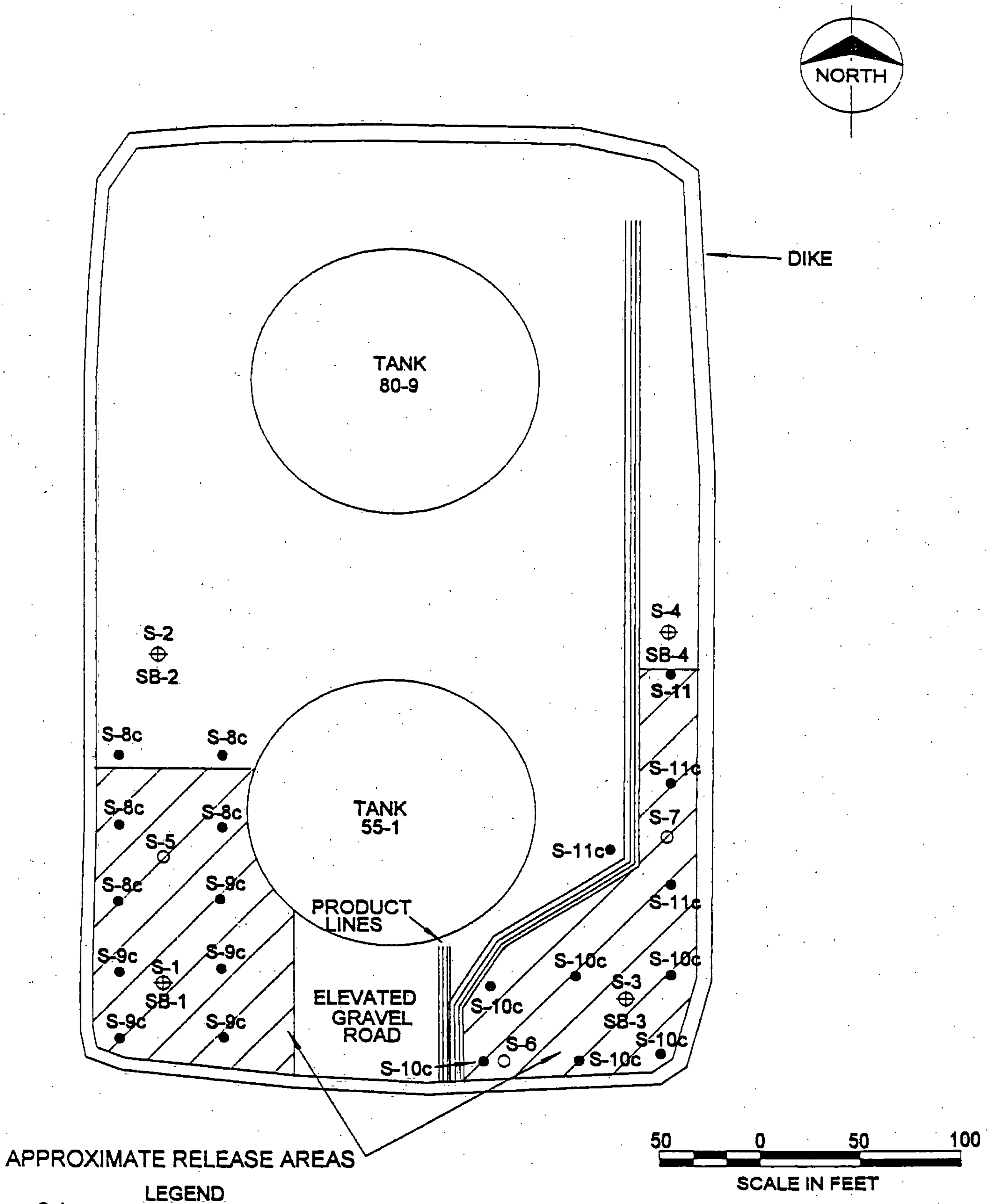
# TABLE 2
## Summary of Subsurface Analytical Results
## Clark Refining & Marketing, Inc.
## Area C, Tank 55-1 Tank Yard
## Hartford, Illinois

| Sample Number: | | TACO | SB-1-2 | | SB-1-7 | | SB-2-5 | | SB-3-2.5 | | SB-3-7.5 | | SB-4-5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/05/96 | |
| COMPOUND | | | | | | | | | | | | | | |
| BTEX | | | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 5 | 170* | 1 | 3 | 1 | BDL | 10 | 270* | 125 | 1.500* | 1 | 2 |
| Toluene | µg/Kg | 5,000 | 5 | 18 | 1 | 3 | 1 | 2 | 10 | 54 | 125 | 340 | 1 | 4 |
| Ethylbenzene | µg/Kg | 5,000 | 5 | 6 | 1 | BDL | 1 | BDL | 10 | 77 | 125 | 920 | 1 | BDL |
| Xylenes (total) | µg/Kg | 74,000 | 5 | 5 | 1 | 1 | 1 | 2 | 10 | 200 | 125 | 900 | 1 | 6 |
| Total BTEX | µg/Kg | | | 199 | | 7 | | 4 | | 601 | | 3,660 | | 12 |
| PNAs | | | | | | | | | | | | | | |
| Naphthalene | µg/Kg | 30,000 | 660 | BDL | 660 | 2,670 | 660 | 1,200 | 660 | BDL | 660 | 1,740 | 660 | BDL |
| Acenaphthylene | µg/Kg | NL | 660 | 1,010 | 660 | 7,510 | 660 | 2,170 | 660 | 889 | 1,670 | 14,100 | 660 | BDL |
| Acenaphthene | µg/Kg | 200,000 | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1200 | BDL |
| Fluorene | µg/Kg | 160,000 | 140 | 878 | 1,400 | 5,150 | 140 | 1,190 | 140 | 140 | 700 | 9,490 | 140 | BDL |
| Phenanthrene | µg/Kg | NL | 660 | 1,520 | 660 | 9,890 | 660 | 3,400 | 660 | BDL | 660 | 5,370 | 660 | BDL |
| Anthracene | µg/Kg | 4,300,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Flouranthene | µg/Kg | 980,000 | 660 | BDL | 660 | 1,630 | 660 | 821 | 660 | BDL | 660 | BDL | 660 | BDL |
| Pyrene | µg/Kg | 1,400,000 | 180 | 292 | 334 | 2,570 | 180 | 1,030 | 180 | BDL | 180 | 376 | 180 | BDL |
| Benzo(a)anthracene | µg/Kg | 700 | 8.7 | 140 | 86.6 | 1,180* | 43.3 | 1,230* | 8.7 | BDL | 8.7 | 245 | 8.7 | BDL |
| Chrysene | µg/Kg | 1,000 | 100 | 695 | 500 | 3,230* | 500 | 12,600* | 100 | BDL | 250 | 6,480* | 100 | BDL |
| Benzo(b)flouranthene | µg/Kg | 4,000 | 12.0 | 242 | 34.0 | 1,210 | 17.0 | 648 | 12.0 | 13.6 | 17.0 | 301 | 12.0 | BDL |
| Benzo(k)flouranthene | µg/Kg | 4,000 | 11.0 | 87.5 | 16.6 | 451 | 11.0 | 42.7 | 11.0 | BDL | 11.0 | 30.1 | 11.0 | BDL |
| Benzo(a)pyrene | µg/Kg | 800 | 15.0 | 100 | 66.0 | 603 | 33.0 | 207 | 15.0 | 16.3 | 33.0 | 118 | 15.0 | BDL |
| Dibenzo(a,h)anthracene | µg/Kg | 800 | 20.0 | 78.7 | 200 | 971* | 20.0 | 303 | 20.0 | BDL | 100 | 267 | 20.0 | BDL |
| Benzo(g,h,i)perylene | µg/Kg | NL | 51.0 | BDL | 250 | BDL | 51.0 | 104 | 51.0 | BDL | 125 | BDL | 51.0 | BDL |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 8,000 | 29.0 | 14.6 | 166 | 915 | 29.0 | 89.5 | 29.0 | BDL | 83.0 | 122 | 29.0 | BDL |

1 - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties
BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020
DL - Detection Limit
µg/Kg - Microgram per kilogram
PNAs - Polynuclear Aromatic Hydrocarbons
BDL - Below detection limit
NL - Compound not listed in TACO Tier 1, Table B
488* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwater)




LEGEND

S-1 / SB-1 - SOIL BORING AND SURFACE BTEX GRAB LOCATIONS

S-10c - PNA ALIQUOT SURFACE SAMPLE LOCATIONS

S-7 SURFACE BTEX GRAB SAMPLE LOCATIONS

Burns & McDonnell Waste Consultants, Inc.

FIGURE 2
Sampling Locations
Tank 55-1 Yard
Release #942837
Clark Refining & Marketing, Inc.

FILE

FILE NUMBER 070.20.01.08 080.58.40

CLARK

RETAIN IN FILE UNTIL ______

201 East Hawthorne
Hartford Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

November 10, 1997

Mr. Jim O'Brien, Manager
Office of Chemical Safety
Illinois Environmental Protection Agency
P.O. Box 19726
Springfield, IL 62794-9726

Re: Tiered Approach Objective Assessment

Dear Mr. O'Brien,

Enclosed is a copy of the Tiered Approach Objective assessment for the spill sites at the Hartford Refinery that was prepared by Burns & McDonnell. Clark Refining and Marketing, Inc. will provide your department with remediation techniques for two of the remaining sites in the near future.

Please call me at 618-254-7301, extension 218 with your questions.

Sincerely,

Massood Modarres
Environmental Engineer

cc: John Sherrill
Tom Miller
File ✓

Burns & McDonnell Waste Consultants, Inc.

November 3, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery: IEPA Spill Nos. 940851, 941772, 942837, 941526, 930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this Tiered Approach to Cleanup Objectives (TACO) assessment of the above-listed spill sites at the Clark Hartford Refinery. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. In this letter report, the data compiled in the September 1996 report for each spill site is evaluated for compliance with TACO Tier I and Tier II cleanup objectives.

## SOIL SAMPLES

Soil sample analytical data for surface and subsurface samples is summarized in Tables 1 and 2, respectively. Tables 1 and 2 are condensed from the September 1996 report and list only the contaminants detected at each spill site in excess of TACO Tier I Cleanup Objectives for Industrial/Commercial properties. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. Spill areas are shown on a map of the refinery, included as Figure 1. Samples from areas that are not listed in the tables were all below the Industrial/Commercial cleanup objectives. TACO Tier 1 Exposure-Route Specific Values for Soils are summarized for the contaminants of concern in Table 3 for the Industrial/Commercial, Construction Worker, and Migration to Groundwater scenarios.

In addition to the soil sampling completed for the September 1996 report, soil samples were collected September 23, 1997 from four areas for analysis of organic carbon. Soil samples were collected from two locations each in Areas B, C, H, and J, and analyzed for

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Organic Matter using ASTM D2974-87 and for Total Organic Carbon using EPA SW-846. The samples were collected from below the contaminated zone at depths ranging from 7 to 12 feet below ground surface. Analytical data is presented in Table 4. Although both methods are approved for determination of the fraction of organic carbon ($f_{oc}$), the site-specific $f_{oc}$ values used for this assessment were calculated from the ASTM method of analyzing for organic matter. These values are also presented in Table 4.

**TIER II CLEANUP OBJECTIVES**

The site-specific $f_{oc}$ was evaluated for Areas B, C, H, and J so that site-specific cleanup objectives could be calculated for the Migration to Groundwater pathway. The TACO Tier I cleanup objectives given in TACO Appendix B, Table A for the Migration to Groundwater pathway are calculated for subsurface soil samples with a default $f_{oc}$ value of 0.002 gm/gm. Table 5 presents the site-specific cleanup objectives for the Migration to Groundwater pathway in addition to the surface and subsurface soil default objectives. The site-specific cleanup objectives were calculated using Equation S17 in TACO Appendix C, Table A. Default values for clay soil were used for density and porosity values.

To use calculated site-specific cleanup objectives, TACO specifies three additional concentration limits that cannot be exceeded for a site:

- the soil saturation limit for each chemical (calculated according to Section 742.220) cannot be exceeded,

- the soil attenuation capacity for each site (calculated according to Section 742.215) cannot be exceeded, and

- a weighted average of 1 (calculated according to Section 742.720) cannot be exceeded at each site for chemicals that target the same organ.

According to TACO Table E in Appendix A, the contaminants of concern to this study that target the same organ include only toluene and ethylbenzene, which both target the kidneys. These contaminants are present together above TACO Tier 1 Industrial/Commercial cleanup objectives for Area B only. Of the 8 samples listed in Table 1, the weighted average exceeds 1 for samples S-1 and S-13.

The soil attenuation capacity is represented by the organic carbon concentration in the soil at each site. The total concentration of all organic contaminants of concern at a site is

compared to the total organic material in the soil at that site. The total organic contaminant concentrations for all areas discussed in this assessment fall below the default organic matter concentration of 2000 milligrams per kilogram (mg/kg). (Please refer to the September 1996 report for complete soil analytical data.)

Soil saturation limits for benzene, toluene, ethylbenzene, and xylenes (BTEX) are given in TACO Appendix A, Table A. As indicated in the footnotes of Table 5, soil saturation limits are used as cleanup objectives when calculated objectives exceed the saturation limits.

**TIER II ASSESSMENTS**

In the following pages, each area is individually evaluated relative to the calculated TACO Tier II cleanup objectives presented in Table 5. All of the areas discussed in this assessment are areas that do not support full-time workers or structures. Clark personnel are present in the areas only intermittently and these areas are not generally accessible to the public. It is therefore reasonable at each of these sites that the construction worker scenario be used for the ingestion and inhalation cleanup objectives.

Each of the assessment pages in Attachment A addresses the status of a single area. The contaminants of concern (COCs) in both surface and subsurface soil are represented by the highest concentration for each in that area (refer to Tables 1 and 2 for complete soil sample information). In cases were detection limits exceed the cleanup objectives, non-detect samples are considered to be in excess of the cleanup objectives. The limiting scenario(s) for each area are determined by selecting the most conservative cleanup objectives from Table 5. The Tier II assessment for each area is then a direct comparison of the site data with the most conservative site-specific cleanup objectives.

**SUMMARY**

TACO assessment of each of the areas at the Clark Refinery, as shown in Attachment A, indicates that Areas A, E, F, G, and H are all below TACO Tier II cleanup objectives for the applicable contaminant pathway scenarios. These areas do not require further assessment or remediation.

Area B, surrounding Tank 35-2 in the tank yard, has surface and subsurface concentrations of BTEX constituents that exceed the TACO Tier II cleanup objectives. The cleanup objectives for this area include the calculated site-specific concentration for benzene (migration to groundwater pathway), and the construction worker scenario concentrations for TEX.

Burns & McDonnell | Waste Consultants, Inc.



Area C, surrounding Tank 55-1 in the tank yard, has subsurface soil concentrations of benzene in two samples that exceed the Tier II cleanup objectives. The benzene cleanup objective for this area is a calculated site-specific concentration for the migration to groundwater pathway.

Area D, surrounding Tank 10-5 in the tank yard, has surface and subsurface soil concentrations of benzene that exceed Tier II cleanup objectives. The benzene cleanup objectives for this area are the generic TACO Tier I values, migration to groundwater pathway, for surface and subsurface soil.

Area J, along Illinois Route 3, has two subsurface soil samples in excess of the Tier II cleanup objectives for benzene, and one subsurface soil sample in excess of the Tier II cleanup objectives for benzo(b)fluoranthene and dibenzo(a,h)anthracene. The cleanup objectives for this area are calculated site-specific concentrations, migration to groundwater pathway, for these three contaminants.

If you have any questions concerning this assessment, please contact me at (314) 305-0077, ext. 226.

Sincerely,

Paul Christian

Paul Christian
Project Manager

attachment

# Table 1
## Tier II Surface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area A | | Area B | | | | | | | | Area C | Area D | | Area E | Area J | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | S-5 | S-6 | S-1 | S-3 | S-6 | S-8 | S-9 | S-10 | S-13 | S-14 | S-8 | S-2 | S-4 | S-13 | SB-5S | SB-6S |
| Benzene | -- | -- | 6.5 | 3.9 | 0.036 | 2.4 | 12 | 0.26 | 53 | 0.1 | -- | 0.27 | 3.1 | -- | -- | -- |
| Toluene | -- | -- | 89 | -- | -- | -- | 63 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | 36 | -- | -- | -- | 19 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | >75 | 110 | -- | 90 | >75 | -- | >75 | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | 1.21 | 0.851 | -- | -- | -- | -- | -- | -- | -- | -- | 2.90 | -- | -- | 1.26 | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | 1.03 | 2.25 | -- | -- | -- | -- | -- | -- | -- | -- | 4.28 | -- | -- | -- | 2.10 | 1.16 |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 2
## Tier II Subsurface Soil Sample Summary
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| | Area B | | | | | | | | | Area C | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-1 | SB1-5 | SB2-2 | SB3-2 | SB3-7 | SB4-2 | SB4-7 | SB5-5 | SB7-5 | SB1-2 | SB1-7 | SB3-2.5 | SB3-7.5 |
| Benzene | 3.2 | <1.25 | <1.25 | 2.7 | 0.33 | <1.25 | 0.052 | <0.125 | 0.38 | 0.17 | -- | 0.27 | 1.5 |
| Toluene | 15 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | 16 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | >75 | -- | -- | >75 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.971 | -- | -- |

| | Area D | | | | | | | | Area H | Area J | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SB1-2 | SB1-7 | SB2-1 | SB2-6 | SB3-1 | SB3-6 | SB4-2 | SB4-7 | SB1-2 | SB1-8 | SB1-13 | SB3-8 | SB3-13 |
| Benzene | 0.16 | 4 | 0.24 | 0.87 | 0.13 | 0.21 | 0.11 | 2.5 | 0.059 | 0.034 | -- | <0.125 | 0.2 |
| Toluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylenes | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 4.94 | -- | 4.09 | 3.93 |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 23.30 | -- | -- | 5.65 |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 9.9 | 1.28 | 1.92 | 1.78 |
| Chrysene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 238 | -- | -- | -- |
| Dibenzo(a,h)anthracene | -- | -- | -- | -- | -- | -- | -- | -- | -- | 18.2 | 12.37 | 3.97 | 3.08 |

* All sample data reported in milligrams per kilogram (mg/kg)

# Table 3
## Exposure-Route Specific Values for Soils
## Illinois Tiered Approach to Cleanup Objectives

| | Industrial/Commercial | | Construction Worker | | Migration to |
|---|---|---|---|---|---|
| | Ingestion | Inhalation | Ingestion | Inhalation | Groundwater |
| Benzene | 200 | 1.5 | 4,300 | 2.1 | 0.03 |
| Toluene | 410,000 | 650 | 410,000 | 42 | 12 |
| Ethylbenzene | 200,000 | 400 | 20,000 | 58 | 13 |
| Xylenes | 1,000,000 | 410 | 410,000 | 410 | 150 |
| Benzo(a)anthracene | 8 | – | 170 | – | 2 |
| Benzo(b)fluoranthene | 8 | – | 170 | – | 5 |
| Benzo(a)pyrene | 0.8 | – | 17 | – | 8 |
| Chrysene | 780 | – | 17,000 | – | 160 |
| Dibenzo(a,h)anthracene | 0.8 | – | 17 | – | 2 |

* All sample data reported in milligrams per kilogram (mg/kg)

**All information reproduced from Title 35, Subtitle G, Chapter I, Subchapter f, Part 742, Appendix B, Table B

# Table 4
## Summary of Fraction Organic Carbon Analysis
## Clark Refining & Marketing
## Clark Refinery
## Hartford, Illinois

| Sample Location & Number | Sample Date | Organic Matter ASTM D2974-87 | Tot. Organic Carbon EPA SW-846 | Average Fraction Organic Carbon[1] |
|---|---|---|---|---|
| Area B - 1 | 09/23/97 | 15,000 | 830 | |
| Area B - 2 | 09/23/97 | 13,900 | 5952 | 0.0145 |
| Area C - 1 | 09/23/97 | 10,800 | 5353 | |
| Area C - 2 | 09/23/97 | 14,800 | 1107 | 0.0128 |
| Area H - 1 | 09/23/97 | 14,600 | 2288 | |
| Area H - 2 | 09/23/97 | 2,570 | 5371 | 0.0089 |
| Area J -1 | 09/23/97 | 7,800 | 2578 | |
| Area J - 2 | 09/23/97 | 2,300 | 2411 | 0.0051 |

* All sample data reported in milligrams per kilogram (mg/kg)

[1] = Average is calculated using ASTM Method data only.

# Table 5
## Tier II Cleanup Objectives - Soil
## Industrial/Residential Scenario
## Migration to Groundwater Pathway
## Illinois Tiered Approach to Cleanup Objectives

| | TACO Generic Cleanup Objectives | | Site Specific Cleanup Objectives | | | |
|---|---|---|---|---|---|---|
| | Surface | Subsurface | Area B | Area C | Area H | Area J |
| | (foc =0.006) | (foc = 0.002) | (foc = 0.015) | (foc = 0.013) | (foc = 0.009) | (foc = 0.005) |
| Benzene | 0.09 | 0.03 | 0.225 | 0.195 | 0.135 | 0.075 |
| Toluene | 36 | 12 | 90 | 78 | 54 | 30 |
| Ethylbenzene | 39 | 13 | 97.5 | 84.5 | 58.5 | 32.5 |
| Xylenes | 410** | 150 | 410** | 410** | 410** | 375 |
| Benzo(a)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |
| Benzo(b)fluoranthene | 15 | 5 | 37.5 | 32.5 | 22.5 | 12.5 |
| Benzo(a)pyrene | 24 | 8 | 60 | 52 | 36 | 20 |
| Chrysene | 480 | 160 | 1,200 | 1,040 | 720 | 400 |
| Dibenzo(a,h)anthracene | 6 | 2 | 15 | 13 | 9 | 5 |

* All sample data reported in milligrams per kilogram (mg/kg)

** Cleanup Objective calculations are limited by the soil saturation concentration (410 mg/kg)

**ATTACHMENT A**

TACO Tier II Assessment Sheets

LOCATION: Area A - NW of Biological Treatment Unit

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario.

COCs - SURFACE:

| | |
|---|---|
| Benzo(a)pyrene | 1.21 mg/kg |
| Dibenzo(a,h)anthracene | 2.25 mg/kg |

COCs - SUBSURFACE: N/A

LIMITING SCENARIO: Migration to Groundwater (generic surface):

| | |
|---|---|
| Benzo(a)pyrene | 24 mg/kg |
| Dibenzo(a,h)anthracene | 6 mg/kg |

TIER II ASSESSMENT:

Surface soil concentrations of both benzo(a)pyrene and dibenzo(a,h)anthracene are below the cleanup objectives for both the construction worker scenario and the migration to groundwater scenario.

| | | |
|---|---|---|
| LOCATION: | Area B - Tank 35-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial Commercial with no full time workers and no structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 53 mg/kg |
| | Toluene | >75 mg/kg |
| | Ethylbenzene | >75 mg/kg |
| | Xylenes | >75 mg/kg |
| COCs - SUBSURFACE: | Benzene | 3.2 mg/kg |
| | Toluene | 15 mg/kg |
| | Ethylbenzene | 16 mg/kg |
| | Xylenes | >75 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.225 mg/kg |
| | Construction Worker: | |
| | Toluene | 47 mg/kg |
| | Ethylbenzene | 58 mg/kg |
| | Xylenes | 410 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-1, S-3, S-8, S-9, S-10, and S-13 are in excess of the limiting scenario cleanup objective for benzene; surface soil samples S-1, S-9, and S-13 exceed the objective for toluene; surface soil sample S-13 exceeds the ethylbenzene objective, and surface soil samples S-1, S-9, and S-13 exceed the xylenes cleanup objective. In addition, the weighted average of toluene and ethylbenzene concentrations exceed 1 for soil samples S-1 and S-13.

Subsurface soil samples SB1-1, SB1-5, SB2-2, SB3-2, SB3-7, SB4-2, and SB7-5 are in excess of limiting scenario cleanup objectives for benzene. Subusurface soil samples SB1-1 and SB3-2 are potentially in excess of the cleanup objective for xylenes.

| | | |
|---|---|---|
| **LOCATION:** | Area C - Tank 55-1 | |
| **MEDIA:** | Soil | |
| **CLASSIFICATION:** | Industrial/Commercial with no full-time workers or structures. Use construction worker scenario. | |
| **COCs - SURFACE:** | Benzo(a)pyrene | 2.90 mg/kg |
| | Dibenzo(a,h)anthracene | 4.28 mg/kg |
| **COCs - SUBSURFACE:** | Benzene | 1.5 mg/kg |
| | Dibenzo(a,h)anthracene | 0.971 mg/kg |
| **LIMITING SCENARIO:** | Migration to Groundwater (site-specific): | |
| | Benzene | 0.195 mg/kg |
| | Dibenzo(a,h)anthracene | 13 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

**TIER II ASSESSMENT:**

All surface soil samples are below cleanup objectives for both the construction worker scenario (Table 3) and the site-specific migration to groundwater scenario (Table 5).

Subsurface soil samples SB3-2.5 and SB3-7.5 are in excess of the migration to groundwater scenario benzene cleanup objective. All subsurface soil samples are below cleanup objectives for dibenzo(a,h)anthracene.

| | | |
|---|---|---|
| LOCATION: | Area D - Tank 10-5 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | ~~Industrial/Commercial with no full-time workers and no~~ structures. Use construction worker scenario. | |
| COCs - SURFACE: | Benzene | 3.1 mg/kg |
| COCs - SUBSURFACE: | Benzene | 4.0 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (generic): | |
| | Benzene (surface) | 0.09 mg/kg |
| | Benzene (subsurface) | 0.03 mg/kg |

TIER II ASSESSMENT:

Surface soil samples S-2 and S-4 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

Subsurface soil samples SB1-2, SB1-7, SB2-1, SB2-6, SB3-1, SB3-6, SB4-2, and SB4-7 are in excess of the cleanup objectives for the migration to groundwater pathway for benzene.

| | | |
|---|---|---|
| LOCATION: | Area E - Tank 120-2 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Benzo(a)pyrene | 1.25 mg/kg |
| COCs - SUBSURFACE: | NA | |
| LIMITING SCENARIO: | Construction Worker:<br>Benzo(a)pyrene | <br>17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario for benzo(a)pyrene.

All subsurface soil samples are below all cleanup objectives for both the construction worker and migration to groundwater scenarios.

LOCATION: Area F - Tank 200-1

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

All surface and subsurface soil samples are below all applicable cleanup objectives.

LOCATION: Area G - Sulfuric Acid Spill Area

MEDIA: Soil

CLASSIFICATION: Industrial/Commercial with no full time workers and no structures.

COCs - SURFACE: NA

COCs - SUBSURFACE: NA

LIMITING SCENARIO: NA

TIER II ASSESSMENT:

Surface soil samples were analyzed for pH and found to be within the normal limits for soil acidity.

| | |
|---|---|
| LOCATION: | Area H - Hawthorne |
| MEDIA: | Soil |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. |
| COCs - SURFACE: | NA |
| COCs - SUBSURFACE: | Benzene 0.059 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): Benzene 0.135 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below all applicable TACO Tier I cleanup objectives.

All subsurface soil samples are below the site-specific migration to groundwater cleanup objective calculated for benzene.

| | | |
|---|---|---|
| LOCATION: | Area J - Route 3 | |
| MEDIA: | Soil | |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. | |
| COCs - SURFACE: | Dibenzo(a,h)anthracene | 2.10 mg/kg |
| COCs - SUBSURFACE: | Benzene | 0.20 mg/kg |
| | Benzo(a)anthracene | 4.94 mg/kg |
| | Benzo(b)fluoranthene | 23.3 mg/kg |
| | Benzo(a)pyrene | 9.9 mg/kg |
| | Chrysene | 238 mg/kg |
| | Dibenzo(a,h)anthracene | 18.2 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): | |
| | Benzene | 0.075 mg/kg |
| | Benzo(a)anthracene | 5 mg/kg |
| | Benzo(b)fluoranthene | 12.5 mg/kg |
| | Chrysene | 400 mg/kg |
| | Dibenzo(a,h)anthracene | 5 mg/kg |
| | Construction Worker: | |
| | Benzo(a)pyrene | 17 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below the cleanup objectives for the construction worker scenario and the site-specific migration to groundwater scenario.

Subsurface soil samples SB3-8 and SB3-13 are in excess of the site-specific migration to groundwater cleanup objectives for benzene. Subsurface soil sample SB1-8 is in excess of the migration to groundwater cleanup objectives for both benzo(b)fluoranthene and dibenzo(a,h)anthracene.

FILE NUMBER 070.05 SPILLS - (Burns - ...)

FILE UNTIL

| Burns & McDonnell | Waste Consultants, Inc. |
|---|---|

November 20, 1997

Old Refinery Historic Contamination

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery:
IEPA Spill Nos. 940851, 941772, 942837, 941526,
930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this proposal for remediation activities at the Clark Refinery Spill Sites listed above. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. A Tiered Approach to Cleanup Objectives (TACO) Tier II assessment of each area was also completed by BMWCI and summarized in the November 3, 1997 BMWCI letter to the Illinois Environmental Protection Agency (IEPA). In the November 3, 1997 letter, Areas A, E, F, G, and H were all determined to be below Tier II cleanup objectives, making remediation of these areas unnecessary. This letter, on the basis of the TACO Tier II assessment, presents Clark's proposed remedial approaches for each of the remaining spill areas (Areas B, C, D, and J).

A => asphalt Crude
E => Crude & gasoil
F =>
G => $H_2SO_4$
H => gasoil

B Bioremediation

As detailed in the November 3, 1997 letter, Area B (gasoline) has surface and subsurface soil samples in excess of TACO Tier II cleanup objectives (CUOs) for benzene, toluene, ethylbenzene, and xylenes (BTEX). Of the 7 subsurface soil samples in excess of Tier II CUOs, 4 are located within the top 2 feet of the surface, including the 2 samples with the highest benzene concentrations. As the majority of the contamination is shallow (less than 2 feet below ground surface), proposed remediation efforts at this area include surface application of heterotrophic bacteria and soil aeration through disking. Therefore, remediation efforts will be concentrated on the top 2 feet of soil in this area.

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Fenton, Missouri 63026

Phone: 314 305-0077
Fax: 314 326-8295

gasoil

Area C, as detailed in the November 3, 1997 letter, has only two samples in excess of Tier II CUOs for benzene. Both of the subsurface soil samples were collected from soil boring SB-3 at ~~depths of 2.5 and 7.5 feet bgs; indicating localized historical contamination.~~ As these benzene concentrations do not appear to be related to the spill event of interest in this report, additional remediation activities are not proposed for Area C.

Naphtha & toluene

A TACO Tier II assessment of Area D was not possible due to difficulty in collecting a site-specific sample for organic carbon analysis. Area D is within the tank farm and is directly across an access road from Area C. Assuming that the fraction of organic carbon in the two areas is comparable, and thereby applying the site-specific CUOs from Area C to Area D, three shallow subsurface soil samples fall below site-specific CUOs. Thus there are two surface and five subsurface soil samples in excess of Tier II CUOs for benzene. The majority ~~of the contamination above Tier II CUOs is subsurface and historical in nature.~~ As these benzene concentrations are not related to the spill event of interest in this report, additional remediation activities are not proposed for Area D.

#2 fuel oil

Area J is along the Route 3 levee in Hartford, Illinois and is under the jurisdiction of both the Wood River Levee District and the Army Corps of Engineers. Access to this area is highly limited by both bureaucratic and physical obstacles. The spill area is only intermittently accessible to vehicle traffic. In addition, ~~the contamination in this~~ Area in excess of TACO Tier II CUOs is limited to subsurface soil. Therefore, additional remediation activities are not proposed for this spill area.

If you have any questions about the proposed remediation activities presented in this letter, please contact me at (314) 305-0077, ext. 226.

Sincerely,

fei

Paul Christian
Project Manager

# APPENDIX P-9

## PUMP HOUSE SPILL
## NOVEMBER 13, 1995

TO: B. Irwin
FROM: M. Modarres
SUBJECT: Expansion joint leak
DATE: Nov.13,1995

I was called by C. Welch @ 12:45 A. On Monday 11\13\95. He informed me of a gasoline leak at the Pumphouse . I arrived @ the refinery about 1:45 A. The shiftforman had called out two Clark drivers to start cleaning the effected area.
The leak was due to a failed 10" Expansion joint , located @ the North side of the Pumphouse control room. The dispatcher , V. Bettorf had been in the process of lining the pump to transfer the product to Clark terminal when the joint failed.
Presence of the Dispatcher at the pump , minimized the spill. The ditch on the West of the Pumphouse, and the ground around the transfer area were the most effected areas. The standing Rain water in those areas minimized the soil contamination. Pumphouse personnel had utilized absorbent booms, and other possible means to stop the gasoline from traveling much beyond the ditch on the West side of their control room. Any gasoline not contained , would have traveled to the cement pond via the ditch South side of 15-1, 15-2. The drainage of TK. 80-10 Hydrotesting water in the same ditch was also helpful to prevent the contamination of the soil. Clark vacuum trucks were positioned on the West side of the Pumphouse ditch and around the leaking expansion joint. An empty barrel was positioned under the leak to clean up the leak at the source. Initial estimated spillage figure is @ 20-30 barrels. The public property was not effected by this spill and the soil contamination is very minimal due to the presence of water from different mentioned sources. I think everyone involved responded quickly and effectively. No agencies were notified due to the containment and the location of the spill.

CC:
F. LAUHER
N. CHRISTIAN
D. CROWN

Clayton
GROUP SERVICES

# APPENDIX P-10

## TANK 162

Source: IEPA BOL

# ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

BUREAU OF LAND/FIELD OPERATIONS SECTION

RCRA INSPECTION REPORT

## GENERAL FACILITY INFORMATION

USEPA ID #: ILD041889023 IEPA ID #: 1190500002

Facility Name: Clark Refining and Marketing, Inc. Phone #: 618/254-73

Location: 201 East Hawthorne Street P.O. Box 7 County: Madison

City: Hartford State: Illinois Zip Code: 62048-00

Region: Collinsville Inspection Date: 9/12/96 Time: 1:40 - 2:45

Weather:

## TYPE OF FACILITY

Notified As: G-1 Regulated As: G-1/S

## TYPE OF INSPECTION

CEI: ____ CME/O&M: ____ CSI: ____ NRR: ____ F/U to: 6/17/96 CC: ____ PIF: ____ CVI: ____ CSE: ____ Other: ____

## NOTIFICATION INFORMATION (EPA 8700-12)

Notification Date: 8/18/80 (initial) ___/___/___ (subsequ

## PART A PERMIT INFORMATION (EPA 3510-3)

Part A Date: 11/18/80 Amended: ___/___/___ Withdrawn: 11/22/

## PART B PERMIT INFORMATION

Part B Submitted/Issued (circle one): ___/___/___

## ACTIVE ENFORCEMENT

Has the company been referred to: USEPA: ___/___/___ IAGO: 10/20/93 County State's Attorney: ___/___/___

## ACTIVE ENFORCEMENT ORDERS

CACO: ___/___/___ CAFO: ___/___/___ Federal Court Order: ___/___/___

Consent Decree: ___/___/___ IPCB Order: ___/___/___ State Court Order: ___/___/___

## TSD FACILITY ACTIVITY SUMMARY

| Activity by Process Code | On Part A? | On Part B? | Activity ever done? | Closed? | Being done during insp? | Exempt per 35 IAC Sec: | On Annual Report 19 | 19 | 1 |
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RECEIVED
OCT 10 1996
IEPA-DLPC

| OWNER | | OPERATOR | |
|---|---|---|---|
| Name: Clark Refining + Marketing | | Name: | |
| Address: 201 East Hawthorne St | | Address: | |
| City: Hartford | | City: | |
| State: Illinois | Zip Code: 62048 | State: | Zip Code: |
| Phone #: 618/254-7301 | | Phone #: | |

| PERSON(S) INTERVIEWED | TITLE | PHONE # |
|---|---|---|
| Massod Madarres | Environmental Manager | 618/254-7301 |
| | | |
| | | |
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| | | |

| INSPECTION PARTICIPANTS | AGENCY/DIVISION | PHONE # |
|---|---|---|
| Chris Cahnovsky | IEPA/EPS | 618/346-5120 |
| | | |
| | | |
| | | |
| | | |

| PREPARED BY | AGENCY/DIVISION | PHONE # |
|---|---|---|
| Chris Cahnovsky | IEPA/EPS | 618/346-5120 |

# SUMMARY OF APPARENT VIOLATIONS

| AREA | SECTION | X | AREA | SECTION | X | AREA | SECTION | X |
|---|---|---|---|---|---|---|---|---|
| DOR | 703.121(a) | X | | | | | | |
| GPT | 722.134(a) | X | | | | | | |
| | (725.156) | X | | | | | | |
| | (725.274) | X | | | | | | |

RECEIVED
OCT 10 1996
IEPA-DLPC

X = Continuing Violation

1190500002 -- Madison County
Clark Refining and Marketing, Inc.
Date of Inspection: September 12, 1996
Prepared by: Chris Cahnovsky

## NARRATIVE

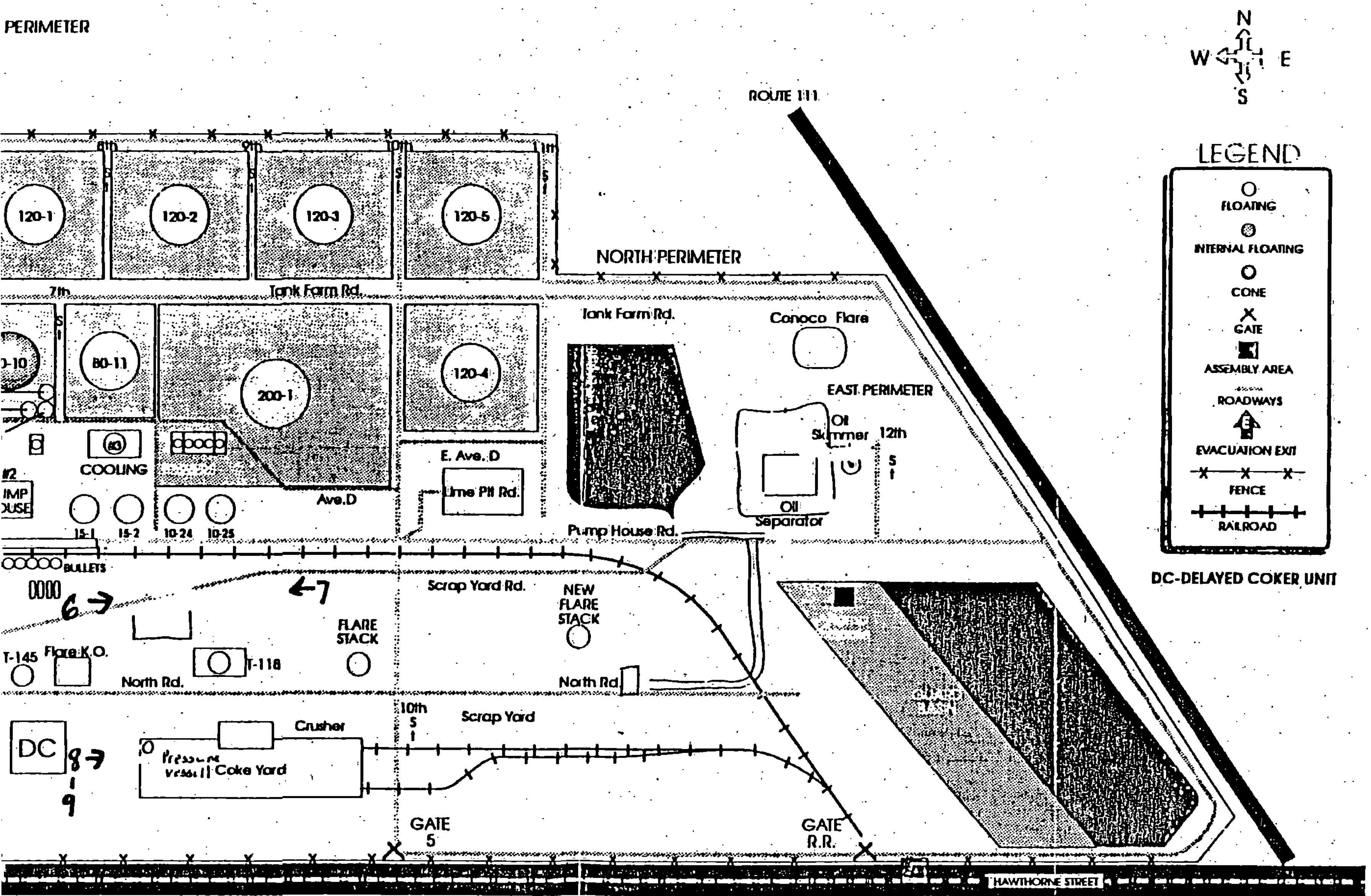
On September 12, 1996 I conducted a Follow-Up Inspection at Clark Refining and Marketing, Inc. In Hartford, Illinois. Present during this inspection was Massod Madarres, Environmental Manager. This inspection is a follow-up to a June 17, 1996 Compliance Evaluation Inspection.

Clark finished the cleaning of Tank 162 in early September and is preparing to begin the cleaning of Tank 161. During the June 17, 1996 CEI, I observed that a hose connected to a pump that was pumping K049, F037 and F038 sludge from Tank 162 to Heritage Environmental's filter presses was leaking. I also observed two roll-off boxes located by the coker unit leaking K049, F037 adn F038 sludge. The contaminated gravel and soil form the area where the hose and roll-off boxes were leaking has been cleaned up. The residue from both sites was placed in the same roll-off box and shipped off-site for treatment and disposal. I inspected both areas and did not observed any uncontained sludge. This technically remediates the apparent violation of 722.134(a), specifically 725.131. According to Mr. Modarres, Heritage Environmental is conducting weekly container inspections of the roll-off boxes accumulated by the coker. The project manager for Heritage was not on-site, so the inspection records and manifest for the spill residue could not be reviewed.

Since the manifest and inspection records could not be reviewed during this inspection, the apparent violation of 722.134(a), specifically 725.274 will remain outstanding. Also, the apparent violations of 703.121(a) and 722.134(a), specificallly 725.156 remain outstanding.

CNC

RECEIVED
OCT 10 1996
IEPA-DLPC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15-1
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10-24
10-25
Pump House Rd.
BULLETS
6 →
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Scrap Yard Rd.
NEW FLARE STACK
FLARE STACK
T-145
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T-118
North Rd.
North Rd.
DC
8 →
9
10th
Scrap Yard
Crusher
Pressure vessel
Coke Yard
GATE 5
GATE R.R.
HAWTHORNE STREET

00558

State of Illinois
# ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director
217/785-8604

2200 Churchill Road, Springfield, IL 62794-9276

CERTIFIED MAIL
P435220149

July 8, 1996

rec'd 7/10/96 cc: Bill

Clark Refining & Marketing, Inc.
Attn: Forrest B. Lauher, Assistant Vice President
201 East Hawthorne
P.O. Box 7
Hartford, Illinois 62048-0007

Bill Please put together and send for review by 7/19/96 Thx JBJ

Re: COMPLIANCE INQUIRY LETTER
1190500002 -- Madison County
Clark Refining & Marketing, Inc.
ILD041889023
Compliance File

Dear Mr. Lauher:

The purpose of this letter is to address the status of the above-referenced facility in relation to the requirements of 35 Ill. Adm. Code Part 722, Subparts A and C and to inquire as to your position with respect to the apparent violations identified in Attachment A and your plans to correct these apparent violations. The Agency's findings of apparent non-compliance are based on an inspection completed on June 17, 1996. For your convenience a copy of the inspection report is enclosed with this letter.

Please submit in writing, within fifteen (15) calendar days of the date of this letter, the reasons for the identified violations, a description of the steps which have been taken to correct the violations and a schedule, including dates, by which each violation will be resolved.

The written response, and two copies of all documents submitted in reply to this letter, should be sent to the following:

Compliance Unit
Illinois Environmental Protection Agency
Bureau of Land #24
Attn: Paul Mason, Compliance Unit
Post Office Box 19276
Springfield, Illinois 62794-9276

Further, take notice that non-compliance with the requirements of the [Illinois] Environmental Protection Act and rules and regulations adopted thereunder may be the subject of enforcement action pursuant to either the [Illinois] Environmental Protection Act, 415 ILCS 5/1 et seq. or the federal Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Sec. 6901 et seq.

If you have any questions regarding the above, please contact Chris Cahnovsky at 618/346-5120.

Sincerely,

David C. Jansen

David C. Jansen, Acting Manager
Field Operations Section
Bureau of Land

DCJ:CNC:NPM:rmi\961811.WPD

Attachment

ATTACHMENT A

1. Pursuant to 35 Ill. Adm. Code 722.134(a), except as provided in subsections (d), (e) or (f), a generator may accumulate hazardous waste on-site for 90 days or less without a permit or without having interim status provided that:

   1. The waste is placed in containers and the generator complies with 35 Ill. Adm. Code 725. Subpart I or the waste is placed in tanks and the generator complies with 35 Ill. Adm. Code 725. Subpart J except 35 Ill. Adm. Code 725.297(c) and 725.300. In addition, such a generator is exempt from all the requirements in 35 Ill. Adm. Code 725. Subparts G and H, except for 35 Ill. Adm. Code 725.211 and 725.214;

   2. The date upon which each period of accumulation begins is clearly marked and visible for inspection on each container;

   3. While being accumulated on-site, each container and tank is labeled or marked clearly with the words, "Hazardous Waste", and

   4. The generator complies with the requirements for owners or operators in 35 Ill. Adm. Code 725 Subparts C [Preparedness and Prevention] and D [Contingency Plan and Emergency Procedures] and with 35 Ill. Adm. Code 725.116 [Personnel Training] and 728.107(a)(4).

   You are in apparent violation of 35 Ill. Adm. Code 722.134(a) in that item(s) 1 and 4 above were not complied with.

   Specifically, the requirements of item 1 and/or 4 above (listed by regulation) which were not complied with, as well as the deficiencies observed, are:

   A) Pursuant to 35 Ill. Adm. Code 725.131, facilities must be maintained and operated to minimize the possibility of a fire, explosion or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil or surface water which could threaten human health or the environment. You are in apparent violation of 35 Ill. Adm. Code 725.131 for the following reason(s): Petroleum refinery primary and secondary (emulsified) oil/water/solids separation sludge (F037 and F038 respectively) and slop oil emulsion solids (K049) were observed pooled around several roll-off boxes. These boxes were labeled F037 and F038 from the clean out of Tank 162.

   B) Pursuant to 35 Ill. Admin. Code 725.156, the emergency coordinator must implement specific emergency procedures in an emergency. You are in apparent violation of 35 Ill. Adm. Code 725.156 for the following reason(s): You failed to immediately respond to a release of Petroleum refinery primary and secondary (emulsified) oil/water/solids separation sludge (F037 and F038 respectively) and slop oil emulsion solids (K049) from several roll-off boxes. These boxes were labeled F037 and F038 from the clean out of Tank 162.

C) Pursuant to 35 Ill. Adm. Code 725.274, the owner or operator must inspect areas where containers are stored at least weekly, looking for leaks and for deterioration caused by corrosion or other factors. You are in apparent violation of 35 Ill. Adm. Code 725.274 for the following reason(s): You failed to conduct weekly container inspections of the roll-off boxes from the clean out of Tank 162.

DCJ:CNC:NPM:rmi\961812.WPD

# ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
## BUREAU OF LAND/FIELD OPERATIONS SECTION
## RCRA INSPECTION REPORT

## GENERAL FACILITY INFORMATION

USEPA ID #: ILD041889023 IEPA ID #: 1190500002

Facility Name: Clark Refining & Marketing Inc Phone #: 618/254-73

Location: 201 E. Hawthorne St. P.O. BOX 7 County: Madison

City: Hartford State: IL Zip Code: 62048-00

Region: Collinsville Inspection Date: 06/17/96 Time: 1:30-2:30p

Weather: Partly Cloudy - Drizzling ~88°F

## TYPE OF FACILITY

Notified As: G-1 Regulated As: G-1/S

## TYPE OF INSPECTION

CEI: X CME/O&M: ___ CSI: ___ NRR: ___ F/U to: __/__/__ CC: ___ PIF: ___ CVI: ___ CSE: ___ Other: ___

## NOTIFICATION INFORMATION (EPA 8700-12)

Notification Date: 8/18/80 (initial) __/__/__ (subsequ

## PART A PERMIT INFORMATION (EPA 3510-3)

Part A Date: 11/18/80 Amended: __/__/__ Withdrawn: 11/23/

## PART B PERMIT INFORMATION

Part B Submitted/Issued (circle one): __/__/__

## ACTIVE ENFORCEMENT

Has the company been referred to: USEPA: __/__/__ IAGO: 10/20/93 County State's Attorney: __/__/__

## ACTIVE ENFORCEMENT ORDERS

CACO: __/__/__ CAFO: __/__/__ Federal Court Order: __/__/__

Consent Decree: __/__/__ IPCB Order: __/__/__ State Court Order: __/__/__

## TSD FACILITY ACTIVITY SUMMARY

| Activity by Process Code | On Part A? | On Part B? | Activity ever done? | Closed? | Being done during insp? | Exempt per 35 IAC Sec: | On Annua Report 19 / 19 / 1 |
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RECEIVED
JUN 24 1996
IEPA-DLPC

| OWNER | | OPERATOR | |
|---|---|---|---|
| Name: Clark Refining & Marketing, Inc. | | Name: | |
| Address: 201 East Hawthorne | | Address: | |
| City: Hartford | | City: | |
| State: Illinois | Zip Code: 62048 | State: | Zip Code: |
| Phone #: 618/254-7301 | | Phone #: | |

| PERSON(S) INTERVIEWED | TITLE | PHONE # |
|---|---|---|
| Massod Modarres | Environmental Manager | 618/254-730 |
| | | |
| | | |
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| INSPECTION PARTICIPANTS | AGENCY/DIVISION | PHONE # |
|---|---|---|
| Chris Cahnovsky | IEPA/BOL | 618/346-5120 |
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| PREPARED BY | AGENCY/DIVISION | PHONE # |
|---|---|---|
| Chris Cahnovsky | IEPA/BOL | 618/346-5120 |

# SUMMARY OF APPARENT VIOLATIONS

| AREA | SECTION | X | AREA | SECTION | X | AREA | SECTION | X |
|---|---|---|---|---|---|---|---|---|
| DOR | 703.121(a) | X | | | | | | |
| GPT | 722.134(a) | | | | | | | |
| | 725.131 | | | | | | | |
| | 725.156 | | | | | | | |
| | 725.274 | | | | | | | |

RECEIVED
JUN 24 1996
IEPA-DLPC

X = Continuing Violation

1190500002 - Madison County
Clark Refining and Marketing, Inc.
Date of Inspection: June 17, 1996
Prepared by: Chris Cahnovsky

## NARRATIVE

On June 17, 1996, I conducted an inspection at Clark Refining and Marketing's Hartford Refinery. Present during this inspection was Masood Madarres, Environmental Engineer.

Clark took the Number 4 Agitator Tank out of service in November 1995. It was replaced by an interim tank. The interim tank was a 21,000-gallon Baker Frac tank. This tank was taken out of service in June 1996. The interim tank was replaced with a permanent new tank system. This new tank is known as Tank T-171. Tank T-171 accumulates waste sludge generated from a DAF process tank. This waste carries the K048 USEPA hazardous waste number. This tank is located in the Bio Oxidation Unit within the secondary containment previously used for the Number 4 Agitator Tank. Tank T-171 has a 16,380 gallon capacity and is equipped with a level sensor and a high level alarm. On June 3, 1996, Black and Veatch Special Projects Corp. (BVSPC) performed a Hazardous waste Tank Assessment on Tank T-171. BVSPC certified this tank system fit for use in hazardous waste service on June 4, 1996.

I conducted an inspection of Tank T-171. This tank is located with in the secondary containment of the old #4 Agitator Tank. I observed cracks and bubbles in the material used to seal the surface of the containment. It does not appear that the integrity of the containment itself has been damaged. The interim tank has been removed from the containment and is in the process of being decontaminated. The interim tank will be returned to the Baker Company. Mr. Modarres said that once the clean out of the equalization tanks is completed, he feels that Tank T-171 will only be used occasionally used to accumulate K048.

Process wastewaters from the refinery are diverted to various cement junction boxes which are connected by solid pipes to two lift stations. These lift stations pump the process water to two flow equalization tanks, Tanks T-161 and T-162. Each of these tanks have a 0.5 million gallon reported capacity and have been in service for approximately two years. The recovered oil from T-161 and T-162 is transferred to Tank 5-10. The recovered oil from 5-10 is charged to the crude line for recycling. Bottom sludge from tanks T-161, T-162 and 5-10 would be considered F037, F038 and K049. Tanks T-161 and T-162 are equipped with man ways for collection of F037, F038 and K049 sludge.

RECEIVED
JUN 24 1996
IEPA-DLPC

During this inspection, I observed that Clark was cleaning Tank 162. Heritage Environmental has been contracted to perform the clean out of Tanks 161 and 162. The bottom sludge from Tank 162 is pumped or vacuum trucked to the lime tank. The sludge/lime mixture is then sent to an on-site filter press for dewatering. The cleaning of Tank 162 is about 85% completed. Heritage is scheduled to clean out Tank 161 next. After the filter press, the sludge is then placed in 20 yd$^3$ roll-off boxes and transported to the delayed coker unit for disposal. The sludge is slurried with Bio water and pumped directly into Tank PV1433. I observed that the hard section hose from Tank 162 to the lime tank was leaking F037, F038 and K049. A dark oil stained area was observed around a coupling. This is an apparent violation of 722.134(a), specifically 725.131.

I then conducted an inspection of the roll-off boxes staged at the coker unit. I observed twenty-one 20 yd$^3$ roll-off boxes. Two of the roll-off boxes contained F037 and F038 from the clean out of the Number 5 Lift Station. The other 19 roll-offs are from the clean out of Tank 162. All of the roll-off boxes appeared to be properly labeled and dated. The latest accumulated start date was May 28, 1996. Mr. Modarres said he is certain that the sludge can be run through the coker before any of the boxes reach their 90-day accumulation limit. I observed that F037, F038 and K049 had leaked out of at least three of the boxes. A large pool of oil was observed between the rows of boxes. This also is an apparent violation of 722.134(a), specifically 725.131. Mr. Modarres did not know when this release had occurred. I asked if weekly container inspections are being conducted of this container accumulation area. He did not know. He said that Heritage was running this operation and he would have to check with them. I spoke with Clint Caswell, Heritage Supervisor and Dave Schwartzkopf, Clark's Construction Supervisor about this project. Mr. Caswell did not know of the leaking boxes. I asked if weekly container inspections are being conducted of this container accumulation area. Mr. Caswell said his people were not conducting weekly inspections. For this reason the apparent violation of 722.134(a), specifically 725.274 is being alleged.

It appears that the release of FO37, F038 and K049 was above the reportable quantity of one pound. I asked that Mr. Modarres report this release to the Illinois Emergency Management Agency. Also, it appears that this release was not immediately addressed upon its occurrence. This is an apparent violation of 722.134(a), specifically 725.156.

As a result of this inspection, the apparent violation of 722.134(a), specifically 725.131, 725.156 and 725.274 is being alleged.

CNC/CLARK3.CEI/DSK3

SENT BY:ILLINOIS EPA; JUN-17-96 MON 17:48 P.01

C00

# Illinois Emergency Management Agency

Incident Number 9 6 1 0 8 3

**FIELD REPORT**

Notify: ILLINOIS EMERGENCY MANAGEMENT AGENCY
1 - 800 / 782 - 7860 or 217 / 782 - 7860

Date: 6 / 17 / 96
Time: 1525
Received by: DL/TK

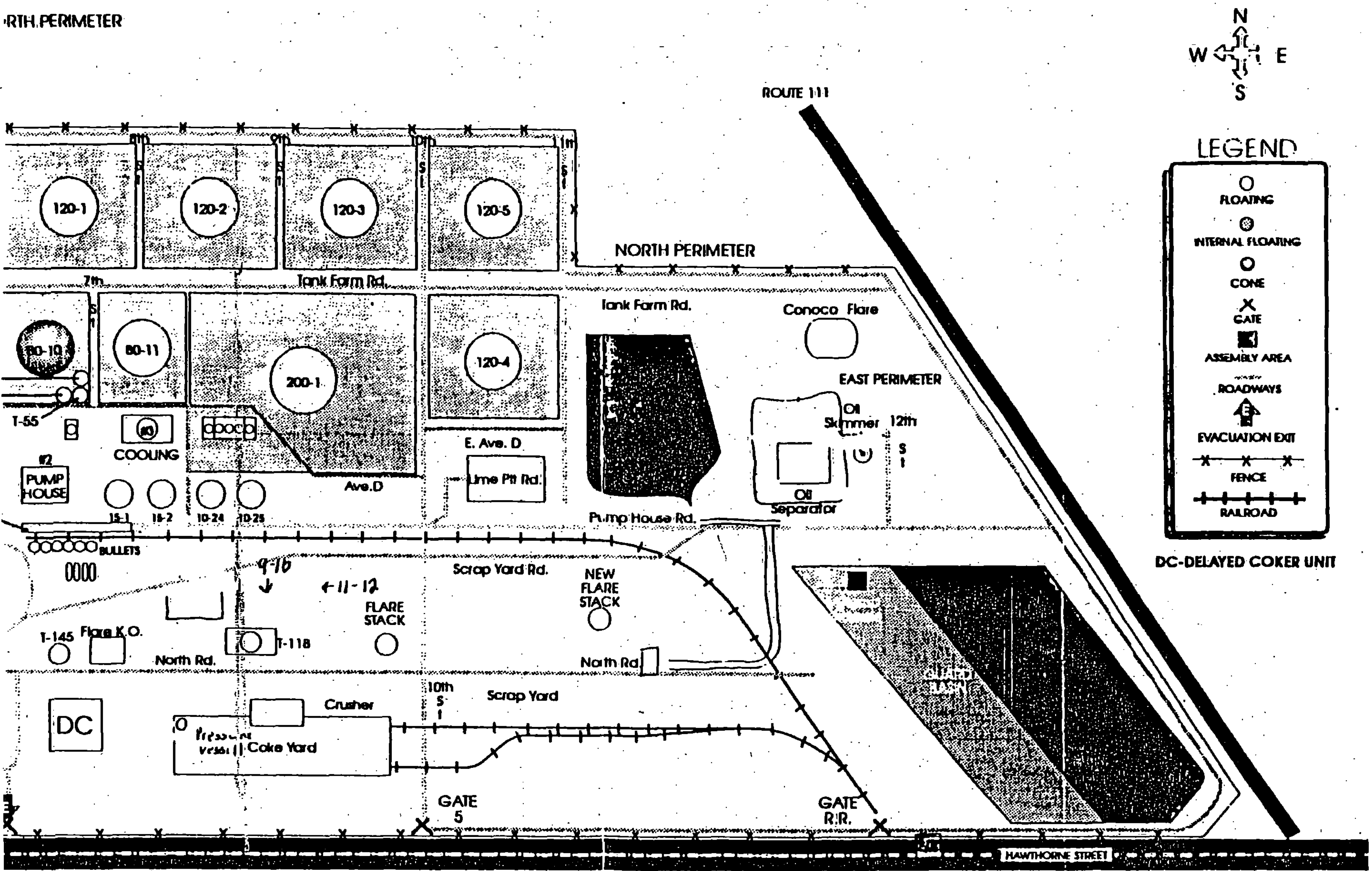
1. Caller: MASSOOD MADARRES
2. Call back phone#: 618/254-6301 EXT. 218
3. Caller represents: CLARK REFINING & MARKETING INC.
4. Type of Incident: [ ] Fire [x] Leak or Spill [ ] Explosion [ ] Water Involvement [ ] Gas or Vapor cloud [ ] Other
5. Incident Location:
   Street: 201 E. HAWTHORN STR.
   City: HARTFORD [ ] In [ ] Near
   County: MADISON
   Milepost ____ [ ] RR [ ] River [ ] Highway
   Sec. ____ Twp. ____ Range ____
6. Area Involved: [ ] Highway [ ] Rail [ ] Fixed Facility [ ] Waterway [ ] Air [x] Other: ROLL OFF BED
7. Material (s) Involved: OILY WATER
   [ ] Gas [ ] Liquid [ ] Semi-Solid [ ] Solid [ ] Pesticide [ ] Radioactive
   CAS #:
   UN/NA #:
   Is this a 302 (a) Extremely Hazardous Substance? [ ] Yes [ ] No [ ] Unknown
   Is this a RCRA Hazardous Waste? [ ] Yes [ ] No [ ] Unknown
   If Yes, is this a RCRA regulated facility? [ ] Yes [ ] No
8. Container: [ ] Truck [ ] RR car [ ] Drum [ ] Aboveground tank [ ] Pipeline [ ] Underground tank [x] Other: ROLL OFF BED
   container size: 20 CUBIC YARD
9. Amount released: 5 TO 10 GAL.
   Rate of release: ____ /min.
10. Cause of release: LEAK IN PLASTIC LINER
11. Estimated spill extent: 64
    [x] square feet [ ] square yards
12. [ ] Occurred Date: __/__/__ Time:
    [x] Discovered Date: 6 /17 /96 Time: 1400

14. On Scene Contact:
    On Scene Phone#:
15. No. injured: -0- [ ] Haz-mat related
    Where taken:
16. Public health risks and/or precautions taken, including # evacuated: -0-
17. Assistance needed from State Agencies:
    YES AS MENTIONED IN #13
18. Containment/cleanup actions and plans:
    HERRITAGE ENVIRONMENTAL ON SCENE
19. Weather: [ ] sunny [ ] overcast [ ] night [ ] ptly. cldy. [ ] rain [ ] snow
    Temp. 90'S F wind dir. CALM speed ____ mph.
20. Responsible Party: #3
    Contact person: #1
    Phone #: #2
    Mailing address: #5 62048

Notifications: 1532 IEPA/HERTZING ADV.
FAXED IEPA/IDPH/REG.8

13. Emergency units contacted
    [ ] Fire
    [ ] Sheriff
    [ ] Police
    [ ] ESDA
    [ ] Other

On scene
[ ] Fire
[ ] Sheriff
[ ] Police
[ ] ESDA
[x] Other: COLLINSVILLE FD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DC-DELAYED COKER UNIT
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NORTH PERIMETER
7th
Tank Farm Rd.
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Tank Farm Rd.
Conoco Flare
EAST PERIMETER
Oil Skimmer
12th
T-55
COOLING
#2 PUMP HOUSE
E. Ave. D
Lime Pit Rd.
Ave.D
Oil Separator
15-1
15-2
10-24
10-25
Pump House Rd.
BULLETS
9-16
11-12
Scrap Yard Rd.
NEW FLARE STACK
FLARE STACK
T-145
Flare K.O.
T-118
North Rd.
North Rd.
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Crusher
10th
Scrap Yard
Pressure Vessel
Coke Yard
GATE 5
GATE R.R.
HAWTHORNE STREET

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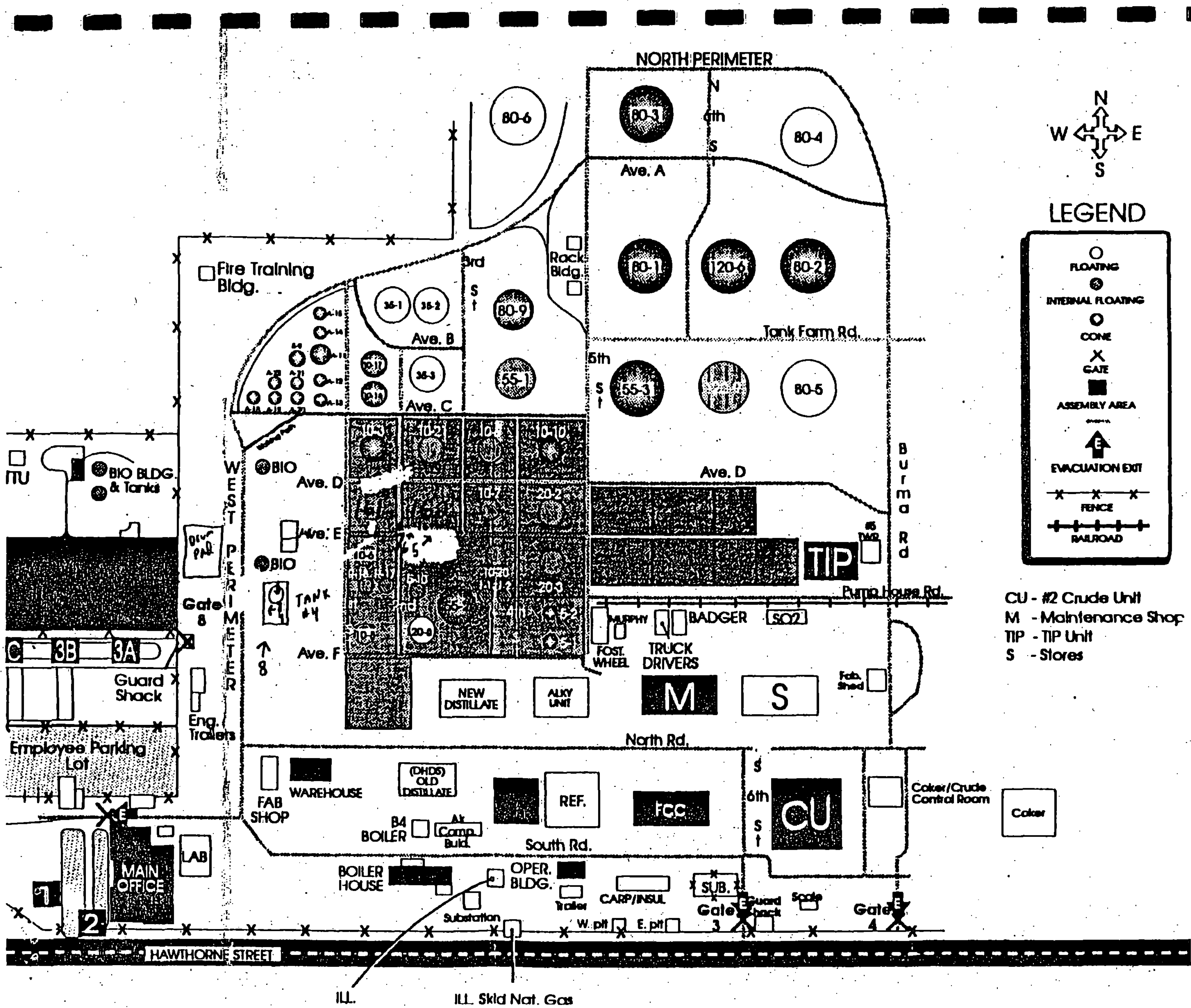
NORTH PERIMETER
N
W
E
S
LEGEND
FLOATING
INTERNAL FLOATING
CONE
GATE
ASSEMBLY AREA
EVACUATION EXIT
FENCE
RAILROAD
CU - #2 Crude Unit
M - Maintenance Shop
TIP - TIP Unit
S - Stores
80-6
80-3
80-4
N 6th St
Ave. A
80-1
120-6
80-2
Rack Bldg.
Fire Training Bldg.
3rd St
35-1
35-2
80-9
Ave. B
Tank Farm Rd.
10-17
35-3
55-1
5th St
55-3
80-5
Ave. C
10-3
10-21
10-8
10-10
W E S T P E R I M E T E R
BIO
Ave. D
10-7
20-2
Ave. D
Burma Rd
ITU
BIO BLDG. & Tanks
Ave. E
BIO
TIP
Pump House Rd.
Gate 8
TANK #4
20-3
MURPHY
BADGER
SO2
20-8
C
3B
3A
Ave. F
FOST. WHEEL
TRUCK DRIVERS
Guard Shack
NEW DISTILLATE
ALKY UNIT
M
S
Fab. Shed
Eng. Trailers
North Rd.
Employee Parking Lot
FAB SHOP
WAREHOUSE
(DHDS) OLD DISTILLATE
REF.
FCC
S 6th St
CU
Coker/Crude Control Room
Coker
B4 BOILER
Air Comp. Bldg.
South Rd.
LAB
MAIN OFFICE
1
2
BOILER HOUSE
OPER. BLDG.
Trailer
CARP/INSUL
SUB.
Guard Shack
Scale
Gate 3
Gate 4
Substation
W. plt
E. plt
HAWTHORNE STREET
ILL.
ILL. Skid Nat. Gas

00559

Clayton GROUP SERVICES

# APPENDIX P-11

## TANK 5-10 RELEASE (FIRE)
## IEMA INCIDENT 981246

# REMEDIATION OBJECTIVES REPORT
# FOR THE TANK 5-10 RELEASE (FIRE) AREA
# CLARK REFINING & MARKETING, INC.
# HARTFORD, ILLINOIS

**JUNE 1999**

**94-155-4-090**
**CLARK**


**Burns & McDonnell Waste Consultants, Inc.**
***Engineers-Geologists-Scientists***
**St. Louis, Missouri**

# TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| BMWCI | Burns & McDonnell Waste Consultants, Inc. |
| BTEX | Benzene, ethylbenzene, toluene, and xylenes |
| IEPA | Illinois Environmental Protection Agency |
| IPCB | Illinois Pollution Control Board |
| mg/kg | Milligrams per kilogram |
| mg/L | Milligrams per liter |
| PAH | Polynuclear aromatic hydrocarbon |
| RAP | Remedial Action Plan |
| ROR | Remediation Objectives Report |
| Clark | Clark Refining & Marketing,Inc. |
| ASTM | American Society for Testing and Materials |
| SSL | Soil Screening Levels |
| RBCA | Risk Based Corrective Action (ASTM E-1739-95) |

* * * * *

# 1.0 INTRODUCTION

## 1.1 SITE LOCATION AND BACKGROUND

On May 26, 1998, Clark Refining & Marketing, Inc. (Clark) had a fire in their recovered oil process area at the Clark Refinery in Hartford, Illinois. Vapors escaped from one of the enclosed fract tanks used in the recovered oil process and ignited. The fire burned the expelled liquid from the tank, and resulting ground fire destroyed the transfer hoses used to connect the recovered oil process tanks. Oil leaking from the damaged hoses continued to fuel the fire. The fire was contained inside the diked area around Tank 5-10 (Site), and a combination of water and foam was applied to extinguish the flames. The fire resulted in the total loss of the recovered oil processing equipment and caused damage to adjacent tanks, equipment, and piping.

Immediately after extinguishing the fire, Clark personnel utilized vacuum trucks to recover the remaining free product and water from the area surrounding the tank. Clark estimates that approximately 140 barrels of oil and 500 barrels of water were recovered. Recovered oil was reprocessed, while recovered water was treated at Clark's aggressive biological wastewater treatment process.

Clark excavated soil from the area around Tank 5-10 in August and September 1998. A total of 20 roll-off containers (containing 12 cubic yards each) were loaded with soil. Approximately 240 cubic yards of soil were disposed of at an approved landfill.

In response to the release, Clark proceeded with an environmental site investigation in the vicinity of Tank 5-10. Clark prepared a sampling and analysis plan (dated October 1998) to address surface soil sampling in the Tank 5-10 vicinity. Burns & McDonnell Waste Consultants, Inc. (BMWCI) conducted the surface soil sampling in accordance with the Clark sampling plan. In February 1999, BMWCI prepared a sampling and analysis plan to address additional surface soil sampling, subsurface soil sampling, and groundwater sampling as requested by the Illinois Environmental Protection Agency (IEPA). This sampling plan was approved by the IEPA on March 22, 1999, and field sampling was conducted from March 30-31, 1999. Findings of the investigation were submitted to the IEPA in the "Site Investigation Report for the Tank 5-10 Area" prepared by BMWCI and dated April 1999.

## 1.2 REPORT PURPOSE

The purpose of this report is to present the proposed remediation objectives for the Site in accordance with the requirements in Section 740.445 of the Illinois Register (Title 35: Environmental Protection; Subtitle G: Waste Disposal; Chapter I: Pollution Control Board; Subchapter F: Risk Based Cleanup Objectives; Part 740 - Site Remediation Program).

* * * * *

# 2.0 REMEDIATION OBJECTIVES

## 2.1 DATA REVIEW

Tier 1 evaluations of soil and groundwater data for the Tank 5-10 area at the Clark Hartford Refinery are presented in the BMWCI report "Site Investigation Report for the Tank 5-10 Area", April 1999. These evaluations indicate there are a number of contaminants present in the Tank 5-10 area exceeding the Tier 1 remediation objectives established by the Illinois Pollution Control Board (IPCB) and IEPA in Part 742 of the Illinois Register. Using site-specific data and the Tier 2 and Tier 3 guidelines presented in Part 742, BMWCI has developed proposed alternative remediation objectives for the contaminants exceeding the Tier 1 remediation objectives. For soil, soil screening level (SSL) equations were used to develop alternative remediation objectives for worker protection for the ingestion and inhalation pathways. Risk-based corrective action (RBCA) equations were used to develop alternative soil remediation objectives for the migration from soil to groundwater pathway. The Domenico Model, as presented in the RBCA equations, was used to develop alternative groundwater remediation objectives for the source areas near Tank 5-10 on the refinery property.

The supporting information and calculations used to develop the proposed alternative remediation objectives are provided in Appendix A. Appendix A is divided into five sections. The first section presents the tables of site- and chemical-specific parameters used in the remediation objective calculations. In the second section, a tabular summary of the field data used in developing the site-specific parameters is presented. The third and fourth sections contain the worksheets for the SSL and RBCA equations. The last section of Appendix A contains illustrations of the chemical-specific source areas used in the soil and groundwater calculations.

## 2.2 SOIL REMEDIATION OBJECTIVES FOR INGESTION EXPOSURE ROUTE

On behalf of Clark, BMWCI requests that the Tier 1 soil remediation objectives for industrial/commercial properties be applied to the Tank 5-10 area with respect to the ingestion exposure route for the following constituents: xylenes and PAHs [excluding benzo(a)anthracene,]. With respect to benzene, toluene, ethylbenzene, and benzo(a)anthracene, BMWCI, on behalf of Clark, proposes the alternative soil cleanup objectives for the ingestion exposure route presented in Table 2-1.

# Table 2-1
# Proposed Soil Remediation Objectives for Ingestion Exposure Route
# Clark Refining & Marketing, Inc.
# Hartford, Illinois Refinery
# Tank 5-10 Release Area

| Contaminant | Industrial-Commercial (mg/kg) | Construction Worker (mg/kg) | Soil Saturation Limit (mg/kg) |
|---|---|---|---|
| Benzene | 350 | 4283* | 870 |
| Benzo(a)anthracene | 23 | 170 | NA |
| Ethylbenzene | 204,400* | 20,405* | 400 |
| Toluene | 408,800* | 40,809* | 650 |

mg/kg - Milligrams per kilogram

* Above the Soil Saturation Limit

The proposed cleanup objectives for benzene, toluene, ethylbenzene, and benzo(a)anthracene were calculated using Equations S1 and S3; however, the default value for exposure duration (25 years) was adjusted to 14.1 years. Data regarding employer and occupational tenure indicates that the median duration of the career of a petroleum refining worker is 9.4 years (Maguire, 1993). The proposed exposure duration of 14.1 years is approximately 50 percent greater than the median petroleum refining worker career duration.

## 2.3 SOIL REMEDIATION OBJECTIVES FOR INHALATION EXPOSURE ROUTE

BMWCI, on behalf of Clark, requests that the Tier 1 Soil Cleanup Objectives for industrial/commercial properties be applied to the Tank 5-10 area with respect to the inhalation exposure route for xylenes. Tier 1 soil remediation objectives for PAHs are not available for the inhalation exposure route. With respect to benzene, toluene, and ethylbenzene, BMWCI, on behalf of Clark, proposes the alternative soil cleanup objective for the inhalation exposure route presented in Table 2-2.

The proposed cleanup objectives for benzene, toluene, and ethylbenzene were calculated by incorporating site-specific soil data into the SSL equations. In addition, the default value for exposure duration (25 years) was adjusted to 14.1 years. Data regarding employer and occupational tenure indicates that the median duration of the career of a petroleum refining worker is 9.4 years (Maguire, 1993). The proposed exposure duration of 14.1 years is approximately 50 percent greater than the median petroleum refining worker career duration.

## 2.4 SOIL REMEDIATION OBJECTIVES FOR MIGRATION TO GROUNDWATER ROUTE

BMWCI, on behalf of Clark, requests that the Tier 1 soil remediation objectives for industrial/commercial properties be applied to the Tank 5-10 area with respect to the migration from soil to Class 1 groundwater route for the following constituents: xylenes and PAHs [excluding benzo(a)anthracene]. With respect to benzene, toluene, ethylbenzene, and benzo(a)anthracene, BMWCI, on behalf of Clark, proposes the alternative soil cleanup objectives for the migration from soil to Class 1 groundwater presented in Table 2-3.

# Table 2-2
# Proposed Soil Remediation Objectives for Inhalation Exposure Route
# Clark Refining & Marketing, Inc.
# Hartford, Illinois Refinery
# Tank 5-10 Release Area

| Contaminant | Industrial-Commercial (mg/kg) | Construction Worker (mg/kg) | Soil Saturation Limit (mg/kg) |
|---|---|---|---|
| Benzene | 31 | 366 | 870 |
| Ethylbenzene | 74,160* | 7106* | 400 |
| Toluene | 23,712* | 2272* | 650 |

mg/kg - Milligrams per kilogram

* - Above Soil Saturation Limit

RBCA equations, with site-specific data, were used to develop remediation objectives for the migration from soil to Class 1 groundwater pathway. The RBCA equations require information on the dimensions of the contaminant source areas (such as width, depth, and distance to receptor) with respect to the direction of groundwater flow. For the Tank 5-10 area, the distance to receptor was measured parallel with the direction of groundwater flow from the center of the contaminant source area being evaluated to the refinery property line. A summary of the source dimension data used in the RBCA equations is presented in Table A-5. Figures illustrating the chemical-specific source areas are also provided in the last section of Appendix A.

The proposed soil remediation objectives for the migration from soil to groundwater pathway can not exceed the soil saturation limits, as specified in Part 742 of the Illinois Register. Therefore, the soil saturation limits for the organic contaminants of concern from Section 742, Appendix A, Table A were used for comparison. BMWCI, on behalf of Clark, proposes the soil cleanup objective for toluene and ethylbenzene to be the soil saturation limit listed in Section 742, Appendix A, Table A, since the Tier 2 calculations indicated cleanup objectives above the soil saturation limit.

### 2.5 REMEDIATION OBJECTIVES FOR GROUNDWATER

On behalf of Clark, BMWCI proposes that the alternative remediation objectives listed in Table 2-4 for Class 1 groundwater be applied to the Tank 5-10 area for benzene and benzo(a)anthracene.

The Domenico Model for steady-state conditions (RBCA Equation R26) was used with site-specific data to develop the proposed alternative remediation objectives for Class 1 groundwater. Information on the dimensions of the contaminant source areas (such as width, depth, and distance to receptor) with respect to the direction of groundwater flow is required by the Domenico Model. For the Tank 5-10 area, the distance to receptor was measured parallel with the direction of groundwater flow from the center of the contaminant source area being evaluated to the refinery property line. Also, the chemical-specific concentration at the source was set equal to the reported maximum concentration of each contaminant of concern. A summary of the source dimension data used in the RBCA equations is presented in Table A-5. Figures illustrating the chemical-specific source areas are also provided in the last section of Appendix A.

**Table 2-3**
**Proposed Soil Remediation Objectives for Migration from Soil to Groundwater**
**Clark Refining & Marketing, Inc.**
**Hartford, Illinois Refinery**
**Tank 5-10 Release Area**

| Contaminant | Class 1 Groundwater (mg/kg) | Soil Saturation Limit (mg/kg) |
|---|---|---|
| Benzene | 35 | 870 |
| Benzo(a)anthracene | 3888 | NA |
| Ethylbenzene | 1.326E+08* | 400 |
| Toluene | 4.859E+13* | 650 |

mg/kg - Milligrams per kilogram
* - Above Soil Saturation Limit

# Table 2-4
## Proposed Remediation Objectives for Groundwater
## Clark Refining & Marketing, Inc.
## Hartford, Illinois Refinery
## Tank 5-10 Release Area

| Contaminant | Class 1 Groundwater (mg/L) |
|---|---|
| Benzene | 97 |
| Benzo(a)anthracene | *0.0094 |
| Toluene | *526 |
| Ethylbenzene | *169 |

mg/L - Milligrams per liter

* Solubility limit in water

(Note: Proposed alternative remediation limits for groundwater cannot be greater than the solubility limit in water for the compound of concern. Where the calculated alternative remediation objective exceeded the solubility, the solubility limit was proposed for the groundwater remediation objective.)

Cx, the predicted concentration at the receptor point (property boundary) calculated with the Domenico Model, was compared to the Class 1 groundwater remediation objectives. All of the predicted chemical concentrations at the property boundary were below the Class 1 groundwater remediation objectives. A worksheet showing the Equation R26 calculations is presented in Section A4 of Appendix A. The estimated allowable contaminant concentrations within the respective source areas that would not cause an exceedance of the Class 1 groundwater remediation objectives at the receptor point were also calculated by modifying Equation R26.

## 2.6 CONTAMINANTS WITH CUMULATIVE NONCARCINOGENIC EFFECTS

The cumulative noncarcinogenic effects of chemicals with similar target organs were addressed using the equation presented in Section 742.720 of Part 742 of the Illinois Register. Upon review of toxicity data, it was noted that toluene and ethylbenzene both affect the liver and kidney. Therefore, weighted averages for cumulative effects were determined for both chemical sets. The concentrations used to determine the weighted average for toluene and ethylbenzene were based on the maximum concentrations detected in individual borings in the Tank 5-10 area. For Surface Samples S-1 and S-8, which are in excess of the proposed soil cleanup objective for toluene (soil saturation limit of 650 mg/kg), calculations resulted in values greater than one (see Table A-6 in Appendix A), indicating that the cumulative effects of toluene and ethylbenzene would be a concern for those sample areas.

The sample areas indicating a cumulative concern for ethylbenzene and toluene are areas in which the individual proposed remediation objective for toluene is also exceeded. The individual remediation objectives for toluene and ethylbenzene proposed in the earlier sections of this report are still applicable to this area. The Remedial Action Plan (RAP) to be completed upon approval of the proposed remediation objectives will address remediation of soils that are in excess of the toluene remediation objective, and will also address the concerns with the cumulative effect of toluene and ethylbenzene.

Calculations for other soil samples with high detections of toluene and ethylbenzene resulted in values less than one (see Table A-6 in Appendix A), indicating that cumulative effects are not of concern in the other areas.

## 2.7 INSTITUTIONAL CONTROLS

If the remediation objectives for industrial-commercial properties are to be applied to the Tank 5-10 area, then an institutional control (i.e., restrictive covenants and deed restrictions, negative easements, ordinances) recognized by the IEPA must be implemented with respect to the refinery. The institutional control(s) for the Hartford refinery will be proposed in the remedial action plan, and implemented prior to applying for site closure. A deed restriction has already been issued for the Guard Basin area of the Hartford refinery. It is not anticipated that the current use of the refinery property is going to change. However, if the use does change to other than industrial-commercial, the area will be evaluated to verify that residual contamination remaining (if any) does not exceed remedial action objectives applicable to the new use of the property.

* * * * *

## 3.0 CONCLUSIONS

Soil sampling results for the Tank 5-10 area indicate 11 of the 17 surface soil samples collected are in excess of Tier 1 cleanup objectives for at least one of the following compounds: benzene, toluene, ethylbenzene, and benzo(a)anthracene. Subsurface sampling indicated 3 of the 9 soil borings had contaminant concentrations which were in excess of the Tier 1 remediation objectives for at least one of the following compounds: benzene, toluene, and benzo(a)anthracene. Tier 2 calculations included in this report utilized SSL and RBCA equations along with site-specific, chemical-specific, and default parameters to generate remediation objectives based on risk associated with this specific site.

Table 3-1 summarizes the results of the Tier 2 and Tier 3 remediation objective calculations presented in this report. Based on this information, the proposed remediation objective for benzene in soil is 31.2 mg/kg (most restrictive exposure pathway for benzene is the soil component of the groundwater ingestion). All surface and subsurface soil benzene concentrations in the area were below 31.2 mg/kg.

The proposed remediation objective for benzo(a)anthracene in soil is 23 mg/kg (most restrictive exposure pathway for benzo(a)anthracene is industrial-commercial ingestion). All surface and subsurface soil benzo(a)anthracene concentrations in the area were below 23 mg/kg.

The proposed remediation objective for ethylbenzene in soil is 400 mg/kg (results from all exposure pathway calculations for ethylbenzene were in excess of the soil saturation limit, so the soil saturation limit was used). All surface and subsurface soil ethylbenzene concentrations in the area were below 400 mg/kg.

The proposed remediation objective for toluene in soil is 650 mg/kg (results from all exposure pathway calculations for toluene were in excess of the soil saturation limit, so the soil saturation limit was used). Toluene concentrations in two surface soil samples were in excess of the proposed remediation objective.

The proposed remediation objective for benzene in groundwater is 97 mg/l. The benzene concentrations in the groundwater sample collected from the release area was below 97 mg/l.

## Table 3-1
## Summary of Proposed Tier 2 Remediation Objectives
## Clark Refining & Marketing, Inc.
## Hartford, Illinois

| | Exposure Route-Specific Values for Soils | | | | | | Soil Component of the Groundwater Ingestion Exposure Route Values RBCA | | Soil Saturation Limit* |
|---|---|---|---|---|---|---|---|---|---|
| | Industrial-Commercial | | | Construction Worker | | | | | |
| Chemical Name | Ingestion (mg/kg) | Inhalation (volatile) (mg/kg) | Inhalation (dust) (mg/kg) | Ingestion (mg/kg) | Inhalation (mg/kg) | Inhalation (dust) (mg/kg) | Class I (mg/kg) | Class II (mg/kg) | Csat (mg/kg) |
| Benzene | 350 | **31** | 1152282 | 4283 | 366 | 13539316 | **35** | 176 | 870 |
| Benzo(a)anthracene | 23 | 147 | 51569 | 170 | 1732 | 605940 | 3888 | 19438 | NA |
| Ethylbenzene | 204400 | 74160 | 1.81E+09 | 20405 | 7106 | 1.735E+08 | 1.326E+08 | 1.894E+08 | **400** |
| Toluene | 408800 | 23712 | 7.24E+08 | 40809 | 2272 | 6.940E+07 | 4.859E+13 | 1.215E+14 | **650** |

| | Groundwater Objective at Source | | Solubility in Water** |
|---|---|---|---|
| Chemical Name | Class I (mg/l) | Class II (mg/l) | (mg/l) |
| Benzene | 97 | 487 | 1750 |
| Benzo(a)anthracene | **6** | 31 | 0.0094 |
| Ethylbenzene | 1.35E+08 | 1.92E+08 | 169 |
| Toluene | 7.89E+13 | 1.97E+14 | 526 |

* - Soil Saturation Limit fromSection 742. Appendix A, Table A

** - Solubility in Water from Section 742. Appendix C, Table E

**35** - Bolded entries indicate cleanup objective based on most restrictive exposure pathway

The proposed groundwater remediation objectives for benzo(a)anthracene, toluene, and benzene at the source were greater than the solubility of each chemical in water, therefore, the water solubility is proposed as the remediation objective for each of these compounds. There were no detections of the compounds of concern in the groundwater sample above the chemical-specific solubility in water.

Upon final acceptance of proposed cleanup objectives, Clark will prepare a RAP to address the areas of the site which remain in excess of the proposed remediation objectives. The RAP will also address necessary institutional controls, as well as sampling requirements following completion of the remedial effort.

* * * * *

# 4.0 REFERENCES


Illinois Register, 1994, Groundwater Quality, Title 35 (Environmental Protection), Subtitle F (Public Water Supplies), Chapter I (Pollution Control Board), Part 620, August 11, 1994.

Illinois Register, 1997a, Site Remediation Program, Title 35 (Environmental Protection), Subtitle G (Waste Disposal), Chapter I (Pollution Control Board), Part 740, June 5, 1997.

Illinois Register, 1997b, Tiered Approach to Corrective Action Objectives, Title 35 (Environmental Protection), Subtitle G (Waste Disposal), Chapter I (Pollution Control Board), Subchapter F (Risk Based Cleanup Objectives, Part 742, June 5, 1997.

Burns & McDonnell Waste Consultants, Inc. (BMWCI), April 1999, Site Investigation Report for the Tank 5-10 Area, Clark Refining & Marketing, Inc., Hartford,, Illinois

Steve Maguire, "Employer and Occupational Tenure: 1991 Update" Monthly Labor Review, June1993, pp 45-56.

U.S. Environmental Protection Agency (EPA), 1999, Integrated Risk Information System (IRIS) Database.

U.S. EPA, 1993, Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, EPA/600/R-93/089, January.


* * * * *

# APPENDIX A
# CLEANUP OBJECTIVE CALCULATIONS AND SUPPORTING INFORMATION

# APPENDIX A
# TABLE OF CONTENTS

# APPENDIX A1
# TABLES

# Table A-1
## Site-Specific Parameters for SSL and RBCA Equations

| SSL Parameters | Definitions, units | Value | Source |
|---|---|---|---|
| Da | apparent diffusivity, $cm^2/s$ | chemical-specific | Eqn S10 |
| Oa | air-filled soil porosity, $cm^3/cm^3$ | 0.06 | Eqn S21 |
| Ot | total soil porosity, $cm^3/cm^3$ | 0.45 | Eqn S24 |
| Ow | water-filled soil porosity, $cm^3/cm^3$ | 0.39 | Eqn S20 |
| Pb | soil bulk density, kg/L or $g/cm^3$ | 1.50 | field |
| Q/C | inverse of the mean concentration at the center of a square source, $(g/m^2\text{-}s)/(kg/m^3)$ | 85.81 | default |
| Foc | fraction organic carbon (unitless) | 0.002 | default/field |

| RBCA Parameters | Definitions, units | Value | Source |
|---|---|---|---|
| alpha x | longitudinal dispersivity, cm | chemical-specific | See Table A-5 |
| alpha y | transverse dispersivity, cm | chemical-specific | See Table A-5 |
| alpha z | vertical dispersivity, cm | chemical-specific | See Table A-5 |
| dgw | groundwater mixing zone thickness, cm | 200 | default |
| foc | organic carbon content, g/g | 0.006 | field |
| i | hydraulic gradient, cm/cm | 2E-02 | field |
| I | infiltration rate, cm/yr | 30 | default |
| K | aquifer hydraulic conductivity, cm/d | 82.2 | field |
| Oas | volumetric air content in vadose zone soils, $cm^3/cm^3$ | 0.15 | Eqn R21 |
| Ot | total soil porosity, $cm^3/cm^3$ | 0.48 | Eqn R23 |
| Ows | volumetric water content in vadose zone soils, $cm^3/cm^3$ | 0.33 | Eqn R22 |
| Pb | soil bulk density, kg/L or $g/cm^3$ | 1.50 | default |
| Ps | soil particle density, $g/cm^3$ | 2.71 | field |
| pw | water density, $g/cm^3$ | 1 | default |
| Sd | source width perpendicular to groundwater flow direction in vertical plane, cm | chemical-specific | See Table A-5 |
| Sw | source width perpendicular to groundwater flow direction in horizontal plane, cm | chemical-specific | See Table A-5 |
| U | specific discharge, cm/d | 3.43 | Eqn R19 |
| Ugw | groundwater darcy velocity, cm/yr | 1.64 | Eqn R24 |
| w | average soil moisture content, g/g | 0.22 | field |
| W | width of source area parallel to direction of groundwater, cm | chemical-specific | See Table A-5 |
| X | distance along the centerline of groundwater plume, cm | chemical-specific | See Table A-5 |

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## Table A-2
## Exposure Parameters for SSL Equations

| Parameter | Definitions, units | Industrial | Construction | Source |
|---|---|---|---|---|
| ATc | averaging time for carcinogens, days | 25550 | 25550 | default |
| ATn | averaging time for noncarcinogens, days | 9125 | 42 | default |
| BW | adult body weight, kg | 70 | 70 | default |
| ED | exposure duration, years | 14.1 | 1 | site-specific |
| EF | exposure frequency, d/yr | 250 | 30 | default |
| IRa | daily outdoor inhalation rate, $m^3/d$ | 20 | 20 | default |
| IRs | soil ingestion rate, mg/d | 50 | 480 | default |
| PEF | particulate emission factor, $m^3/kg$ | 1.24E+09 | - | default |
| PEF' | particulate emission factor adjusted for agitation, $m^3/kg$ | - | 1.24E+08 | Eqn S16 |
| RfC | inhalation reference concentration, $mg/m^3$ | chemical-specific | chemical-specific | see Table A-4 |
| RfDi | inhalation reference dose, mg/kg-d | chemical-specific | chemical-specific | see Table A-4 |
| RfDo | oral reference dose, mg/kg-d | chemical-specific | chemical-specific | see Table A-4 |
| SA | skin surface area, $cm^2/d$ | 3160 | 3160 | default |
| SFi | inhalation slope factor, $(mg/kg\text{-}d)^{-1}$ | chemical-specific | chemical-specific | see Table A-4 |
| SFo | oral slope factor, $(mg/kg\text{-}d)^{-1}$ | chemical-specific | chemical-specific | see Table A-4 |
| THQ or THI | target hazard quotient | 1 | 1 | default |
| TR | target cancer risk | 1E-06 | 1E-06 | default |
| VF | volatilization factor $m^3/kg$ | chemical-specific | - | Eqn S8 |
| VF' | volatilization factor adjusted for agitation, $m^3/kg$ | - | chemical-specific | Eqn S9 |
| URF | inhalation unit risk factor, $(ug/m^3)^{-1}$ | chemical-specific | chemical-specific | see Table A-4 |

Notes:
Information on occupation-specific tenure was used in determining exposure duration for long-term industrial worker.
14.1 years is 50% greater than the median tenure of 9.4 years for a petroleum refining worker (Maguire, 1993).

## Table A-3
## Chemical Physical Properties

| | Solubility in Water, S (mg/L) | Diffusivity in Air, Di or Dair (cm²/s) | Diffusivity in Water, Dwat (cm²/s) | Henry's Law Constant, H' at 25' (unitless) | Organic Carbon Partition Coefficient Koc (L/kg) | First Order Degradation Constant, n (1/day) |
|---|---|---|---|---|---|---|
| **Organics** | | | | | | |
| Benzene | 1750 | 0.088 | 9.8E-06 | 0.228 | 58.9 | 0.0009 |
| Benzo(a)anthracene | 0.0094 | 0.051 | 9.0E-06 | 0.000137 | 398000 | 0.00051 |
| Ethylbenzene | 169 | 0.075 | 7.8E-06 | 0.323 | 363 | 0.003 |
| Toluene | 526 | 0.087 | 8.6E-06 | 0.272 | 182 | 0.011 |

## Table A-4
## Chemical Toxicological Properties

| | RfDo (mg/kg-d) | Ref | SFo 1/(mg/kg-d) | Ref | RfDi (mg/kg-d) | Ref | SFi 1/(mg/kg-d) | Ref | RfC ($mg/m^3$) | Ref | URF ($ug/m^3$) | Ref |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | | | | |
| Benzene | - | | 2.9E-02 | i | - | | 2.9E-02 | i | - | | 7.8E-06 | i |
| Benzo(a)anthracene | - | | 7.3E-01 | s | - | | 6.1E-01 | s | - | | 1.7E-04 | c |
| Ethylbenzene | 1E-01 | i | - | | | | - | | 1E+00 | i | | |
| Toluene | 2E-01 | i | - | | | | - | | 4E-01 | i | | |

Notes:
Dash indicates that a value was not available.
References for toxicity values are found in the column to right of value.
i = IRIS (USEPA, 1998)
c = converted
s = surrogate chemical basis (USEPA, 1993)

Chemicals with same target organs for noncarcinogenic effects:
ethylbenzene and toluene (liver, kidney)

## Table A-5
## Source Characteristics for RBCA Equations

| | X (ft) | W (ft) | Sw (ft) | Sd (ft) | X (cm) | W (cm) | Sw (cm) | Sd (cm) | alpha x | alpha y | alpha z |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | | | |
| Benzene | 1000 | 125 | 80 | 10 | 30480 | 3810 | 2438.4 | 304.8 | 3048 | 1016 | 152 |
| Benzo(a)anthracene | 1000 | 25 | 25 | 2 | 30480 | 762 | 762 | 60.96 | 3048 | 1016 | 152 |
| Ethylbenzene | 1000 | 50 | 25 | 3 | 30480 | 1524 | 762 | 91.44 | 3048 | 1016 | 152 |
| Toluene | 1000 | 50 | 40 | 10 | 30480 | 1524 | 1219.2 | 304.8 | 3048 | 1016 | 152 |

Notes:
X, W, Sw, and Sd were determined for each chemical source area as illustrated in Figures 2,3,4, and 5.
Values for alpha x, y, and z were determined using Equations R16, R17, and R18, respectively.

# Table A-6
# Chemicals with Cumulative Effects

$$W,ave = \frac{x,1}{CUO,1} + \frac{x,2}{CUO,2} + \frac{x,n}{CUO,n}$$

where:

W,ave = weighted average

x,1 to n = chemical concentration at location of concern

CUO,1 to n = Tier 2 cleanup objective in soil

| Sample Location | Chemical Name | W,ave unitless | W unitless | x mg/kg | CUO mg/kg |
|---|---|---|---|---|---|
| S-1 | Ethylbenzene | 13.90 | 0.04 | 15.30 | 400 |
| | Toluene | | 13.86 | 9010.00 | 650 |
| S-8 | Ethylbenzene | 2.21 | 0.09 | 34.20 | 400 |
| | Toluene | | 2.12 | 1380.00 | 650 |
| S-2 | Ethylbenzene | 0.07 | 0.00 | 0.62 | 400 |
| | Toluene | | 0.06 | 42.10 | 650 |
| S-7 | Ethylbenzene | 0.07 | 0.00 | 0.62 | 400 |
| | Toluene | | 0.06 | 42.10 | 650 |
| S-10 | Ethylbenzene | 0.01 | 0.01 | 2.30 | 400 |
| | Toluene | | 0.00 | 1.17 | 650 |

# APPENDIX A2
# FIELD DATA SUMMARY

# Worksheet for Field Data

| Sample ID | Sample Depth (feet) | pH | log pH | Percent Moisture | Pb (g/cm³) | Ps (g/cm³) | Foc |
|---|---|---|---|---|---|---|---|
| S-4 | 1 | 5.78 | 602559.586 | NA | NA | NA | NA |
| NE-7 | 7 | 7.33 | 21379620.9 | NA | NA | NA | NA |
| S-9 | 2.5 | 7.47 | 29512092.3 | 28.1 | 1.50 | 2.72 | 0.0060 |
| S-9 | 7.5 | NA | NA | NA | 1.50 | 2.698 | NA |
| S-9 | 9 | NA | NA | 21.3 | NA | NA | 0.0007 |
| S-11 | 3 | NA | NA | 24 | NA | NA | 0.0024 |
| S-11 | 5 | 7.85 | 70794578.4 | NA | NA | NA | NA |
| S-12 | 1 | 7.35 | 22387211.4 | NA | NA | NA | NA |
| E-14 | 14 | NA | NA | 19.5 | 1.50 | 2.692 | 0.0007 |
| S-14 | 6 | 8.11 | 128824955 | NA | NA | NA | NA |
| S-15 | 3 | NA | NA | NA | 1.50 | 2.717 | NA |
| S-15 | 12 | NA | NA | 15.9 | 1.50 | 2.708 | 0.0009 |
| | | | 27350101.8 | | | | |
| **Averages:** | | | **7.44** | **21.8** | **1.5** | **2.7** | **0.002** |

Notes:
Average pH was determined using log data
NA - Not Analyzed

# APPENDIX A3
# WORKSHEETS FOR SSL EQUATIONS

## SSL Worksheet for ingestion exposure route, noncarcinogenic - Equation S1
## Industrial Worker

Soil Objective = $\frac{THI \times BW \times ATn}{1/RfDo \times UC \times ED \times EF \times IRs}$

| Chemical | Soil Obj. mg/kg | THI unitless | BW kg | ATn days | RfDo mg/kg-day | UC kg/mg | ED years | EF days/yr | IRs mg/day |
|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | |
| Benzene | NA | 1 | 70 | 5147 | - | 1.0E-06 | 14.1 | 250 | 50 |
| Benzo(a)anthracene | NA | 1 | 70 | 5147 | - | 1.0E-06 | 14.1 | 250 | 50 |
| Ethylbenzene | 204400 | 1 | 70 | 5147 | 0.1 | 1.0E-06 | 14.1 | 250 | 50 |
| Toluene | 408800 | 1 | 70 | 5147 | 0.2 | 1.0E-06 | 14.1 | 250 | 50 |

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## SSL Worksheet for ingestion exposure route, noncarcinogenic - Equation S1
## Construction Worker

$$\text{Soil Objective} = \frac{THI \times BW \times ATn}{1/RfDo \times UC \times ED \times EF \times IRs}$$

| Chemical | Soil Obj. mg/kg | THI unitless | BW kg | ATn days | RfDo mg/kg-day | UC kg/mg | ED years | EF days/yr | IRs mg/day |
|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | |
| Benzene | NA | 1 | 70 | 42 | - | 1.0E-06 | 1 | 30 | 480 |
| Benzo(a)anthracene | NA | 1 | 70 | 42 | - | 1.0E-06 | 1 | 30 | 480 |
| Ethylbenzene | 20405 | 1 | 70 | 42 | 0.1 | 1.0E-06 | 1 | 30 | 480 |
| Toluene | 40809 | 1 | 70 | 42 | 0.2 | 1.0E-06 | 1 | 30 | 480 |

**SSL Worksheet for ingestion exposure route, carcinogenic - Equation S3**
**Industrial Worker**

$$\text{Soil Objective} = \frac{TR \times BW \times ATc}{SF \times UC \times ED \times EF \times IRs}$$

| Chemical | Soil Obj. mg/kg | TR unitless | BW kg | ATc days | SFo 1/(mg/kg-day) | UC kg/mg | ED years | EF days/yr | IRs mg/day |
|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | |
| Benzene | 349.9 | 1.0E-06 | 70 | 25550 | 0.029 | 1.0E-06 | 14.1 | 250 | 50 |
| Benzo(a)anthracene | 23.2 | 1.0E-06 | 70 | 25550 | 0.73 | 1.0E-06 | 14.1 | 150 | 50 |

## SSL Worksheet for ingestion exposure route, carcinogenic - Equation S3
## Construction Worker

$$\text{Soil Objective} = \frac{TR \times BW \times ATc}{SF \times UC \times ED \times EF \times IRs}$$

| Chemical | Soil Obj. mg/kg | TR unitless | BW kg | ATc days | SFo 1/(mg/kg-day) | UC kg/mg | ED years | EF days/yr | IRs mg/day |
|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | |
| Benzene | 4283 | 1.0E-06 | 70 | 25550 | 0.029 | 1.0E-06 | 1 | 30 | 480 |
| Benzo(a)anthracene | 170 | 1.0E-06 | 70 | 25550 | 0.73 | 1.0E-06 | 1 | 30 | 480 |

## SSL Worksheet for inhalation of volatiles exposure route, noncarcinogenic - Equation S4
## Industrial Worker

$$\text{Soil Objective} = \frac{\text{THQ} \times \text{ATn}}{\text{EF} \times \text{ED} \times (1/\text{RfC} \times 1/\text{VF})}$$

| | Soil Obj. mg/kg | THQ unitless | ATn days | EF days/yr | ED yrs | RfC mg/m³ | VF m³/kg |
|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | |
| Benzene | NA | 1 | 5147 | 250 | 14.1 | - | 33530 |
| Benzo(a)anthracene | NA | 1 | 5147 | 250 | 14.1 | - | 3544727 |
| Ethylbenzene | 74159.80 | 1 | 5147 | 250 | 14.1 | 1 | 50794 |
| Toluene | 23712.32 | 1 | 5147 | 250 | 14.1 | 0.4 | 40603 |

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## SSL Worksheet for inhalation of volatiles exposure route, noncarcinogenic - Equation S5
## Construction Worker

$$\text{Soil Objective} = \frac{THQ \times ATn}{EF \times ED \times (1/RfC \times 1/VF')}$$

| | Soil Obj. mg/kg | THQ unitless | ATn days | EF days/yr | ED yrs | RfC mg/m³ | VF' m³/kg | VF m³/kg |
|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | |
| Benzene | NA | 1 | 42 | 30 | 1 | - | 3353 | 33530 |
| Benzo(a)anthracene | NA | 1 | 42 | 30 | 1 | - | 354473 | 3544727 |
| Ethylbenzene | 7106.98 | 1 | 42 | 30 | 1 | 1 | 5079 | 50794 |
| Toluene | 2272.43 | 1 | 42 | 30 | 1 | 0.4 | 4060 | 40603 |

*Note:*
VF' = VF/10 (Equation S9)

## SSL Worksheet for inhalation of volatiles exposure route, carcinogenic - Equation S6
## Industrial Worker

$$\text{Soil Objective} = \frac{TR \times ATc}{URF \times UC \times EF \times ED \times 1/VF}$$

| | Soil Obj. mg/kg | TR unitless | AT days | URF 1/(ug/m³) | UC ug/mg | EF days/yr | ED yr | VF m³/kg |
|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | |
| Benzene | 31.2 | 1E-06 | 25550 | 7.8E-06 | 1000 | 250 | 14.1 | 33530 |
| Benzo(a)anthracene | 147 | 1E-06 | 25550 | 1.7E-04 | 1000 | 250 | 14.1 | 3544727 |

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## SSL Worksheet for inhalation of volatiles exposure route, carcinogenic - Equation S7
## Construction Worker

$$\text{Soil Objective} = \frac{TR \times ATc}{URF \times UC \times EF \times ED \times 1/VF'}$$

| | Soil Obj. mg/kg | TR unitless | AT days | URF 1/(ug/m³) | UC ug/mg | EF days/yr | ED yr | VF' m³/kg | VF m³/kg |
|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | |
| Benzene | 366 | 1E-06 | 25550 | 7.8E-06 | 1000 | 30 | 1 | 3353 | 33530 |
| Benzo(a)anthracene | 1732 | 1E-06 | 25550 | 1.7E-04 | 1000 | 30 | 1 | 354473 | 3544727 |

Note:
VF' = VF/10 (Equation S9)

## SSL Worksheet for Volatilization Factor - Equation S8

VF = Q/C x (pi x Da x T)^.5 /( 2 x Pb x Da) x UC

| Chemical | VF $m^3/kg$ | Da $cm^2/s$ | QC $(g/m^2-s)/(kg/m^3)$ | Time sec | Pb $g/cm^3$ | UC $m^2/cm^2$ |
|---|---|---|---|---|---|---|
| **Organics** | | | | | | |
| Benzene | 3.35E+04 | 1.81E-05 | 85.81 | 7.90E+08 | 1.50 | 0.0001 |
| Benzo(a)anthracene | 3.54E+06 | 1.62E-09 | 85.81 | 7.90E+08 | 1.50 | 0.0001 |
| Ethylbenzene | 5.08E+04 | 7.87E-06 | 85.81 | 7.90E+08 | 1.50 | 0.0001 |
| Toluene | 4.06E+04 | 1.23E-05 | 85.81 | 7.90E+08 | 1.50 | 0.0001 |

## SSL Worksheet for Apparent Diffusivity - Equation S10

Da = Dw)/Ot²] x [1/(Pb x Kd +Ow + (Oa x H')]

| Chemical | Da cm²/s | Pb g/cm³ | foc g/g | Koc cm³/g | Kd cm³/g | Di cm²/s | Dw cm²/s | Henry's Constant (unitless) | Ow cm³/cm³ | Ot cm³/cm³ | Oa cm³/cm³ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | | | |
| Benzene | 1.81E-05 | 1.50 | 0.002 | 5.89E+01 | 1.18E-01 | 8.80E-02 | 9.80E-06 | 2.28E-01 | 0.390 | 0.45 | 0.06 |
| Benzo(a)anthracene | 1.62E-09 | 1.50 | 0.002 | 3.98E+05 | 7.96E+02 | 5.10E-02 | 9.00E-06 | 1.37E-04 | 0.39 | 0.45 | 0.06 |
| Ethylbenzene | 7.87E-06 | 1.50 | 0.002 | 3.63E+02 | 7.26E-01 | 7.50E-02 | 7.80E-06 | 3.23E-01 | 0.39 | 0.45 | 0.06 |
| Toluene | 1.23E-05 | 1.50 | 0.002 | 1.82E+02 | 3.64E-01 | 8.70E-02 | 8.60E-06 | 2.72E-01 | 0.39 | 0.45 | 0.06 |

**SSL Worksheet for inhalation of dust exposure route, noncarcinogenic - Equation S11**
**Industrial Worker**

$$\text{Soil Objective} = \frac{THI \times ATn}{ED \times EF \times (1/RfC \times 1/PEF)}$$

| Chemical | Soil Obj. mg/kg | THI unitless | ATn days | ED years | EF days/yr | RfC mg/m³ | PEF m³/kg |
|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | |
| Benzene | NA | 1 | 5147 | 14.1 | 250 | - | 1.24E+09 |
| Benzo(a)anthracene | NA | 1 | 5147 | 14.1 | 250 | - | 1.24E+09 |
| Ethylbenzene | 1810400000 | 1 | 5147 | 14.1 | 250 | 1 | 1.24E+09 |
| Toluene | 724160000 | 1 | 5147 | 14.1 | 250 | 0.4 | 1.24E+09 |

## SSL Worksheet for inhalation of dust exposure route, noncarcinogenic - Equation S12
## Construction Worker

$$\text{Soil Objective} = \frac{THI \times ATn}{ED \times EF \times (1/RfC \times 1/PEF')}$$

| Chemical | Soil Obj. mg/kg | THI unitless | ATn days | ED years | EF days/yr | RfC mg/m³ | PEF' m³/kg | PEF m³/kg |
|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | |
| Benzene | NA | 1 | 42 | 1 | 30 | - | 1.24E+08 | 1.24E+09 |
| Benzo(a)anthracene | NA | 1 | 42 | 1 | 30 | - | 1.24E+08 | 1.24E+09 |
| Ethylbenzene | 173496667 | 1 | 42 | 1 | 30 | 1 | 1.24E+08 | 1.24E+09 |
| Toluene | 69398667 | 1 | 42 | 1 | 30 | 0.4 | 1.24E+08 | 1.24E+09 |

Note:
PEF' = PEF/10 (Equation S16)

**SSL Worksheet for inhalation of dust exposure route, carcinogenic - Equation S13**
**Industrial Worker**

$$\text{Soil Objective} = \frac{TR \times ATc}{URF \times UC \times ED \times EF \times 1/PEF}$$

| Chemical | Soil Obj. mg/kg | TR unitless | ATc days | URF 1/(ug/m³) | UC ug/mg | ED years | EF days/year | PEF m³/kg |
|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | |
| Benzene | 1152282 | 1E-06 | 25550 | 7.8E-06 | 1000 | 14.1 | 250 | 1.24E+09 |
| Benzo(a)anthracene | 51569 | 1E-06 | 25550 | 1.7E-04 | 1000 | 14.1 | 250 | 1.24E+09 |

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## SSL Worksheet for inhalation of dust exposure route, carcinogenic - Equation S14
## Construction Worker

$$\text{Soil Objective} = \frac{TR \times ATc}{URF \times UC \times ED \times EF \times 1/PEF'}$$

| Chemical | Soil Obj. mg/kg | TR unitless | ATc days | URF 1/(ug/m³) | UC ug/mg | ED years | EF days/year | PEF' m³/kg | PEF m³/kg |
|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | |
| Benzene | 13539316 | 1E-06 | 25550 | 7.8E-06 | 1000 | 1 | 30 | 1.24E+08 | 1.24E+09 |
| Benzo(a)anthracene | 605940 | 1E-06 | 25550 | 1.7E-04 | 1000 | 1 | 30 | 1.24E+08 | 1.24E+09 |

Note:
PEF' = PEF/10 (Equation S16)

# APPENDIX A4
# WORKSHEETS FOR RBCA EQUATIONS

## RBCA Worksheet for remediation objectives in soil for protection of groundwater

### Equation 12

Objective in Soil = GWsource /LFsw

### Equation 13

GW source = GW comp /( Cx/Csource)

| | Class 1 Soil Obj. (mg/kg) | Class 2 Soil Obj. (mg/kg) | LFsw (kg/L) | Class 1 GWsource (mg/L) | Class 2 GWsource (mg/L) | Cx/ Csource (unitless) | Class 1 GWcomp (mg/L) | Class 2 GWcomp (mg/L) |
|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | |
| Benzene | 35.19 | 1.76E+02 | 2.77E+00 | 9.73E+01 | 4.87E+02 | 5.14E-05 | 0.005 | 0.025 |
| Benzo(a)anthracene | 3887.55 | 1.94E+04 | 1.24E-03 | 4.81E+00 | 2.41E+01 | 2.08E-05 | 0.0001 | 0.0005 |
| Ethylbenzene | 1.33E+08 | 1.89E+08 | 1.01E+00 | 1.35E+08 | 1.92E+08 | 5.20E-09 | 0.7 | 1 |
| Toluene | 4.86E+13 | 1.21E+14 | 1.62E+00 | 7.89E+13 | 1.97E+14 | 1.27E-14 | 1 | 2.5 |

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## RBCA Worksheet for leaching factor - Equation R14

LFsw = (Ps x UC)/[(Ows + (Ks x Ps) + (H' x Oas)) x (1 + (Ugw x dgw)/(I x W))]

| | LFsw (kg/L) | Ps (g/cm³) | Ows (unitless) | Oas (unitless) | Ot (unitless) | Ugw (cm/yr) | K (cm/d) | i (unitless) | I (cm/yr) | dgw (cm) | W (cm) | UC (cm³-kg/L-g) | H' (unitless) | Ks (cu.cm/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | | | | | | |
| Benzene | 2.8E+00 | 1.50 | 0.33 | 0.15 | 0.48 | 1.644 | 82.2 | 0.02 | 30 | 200 | 3810 | 1 | 0.228 | 0.1178 |
| Benzo(a)anthracene | 1.2E-03 | 1.50 | 0.33 | 0.15 | 0.48 | 1.644 | 82.2 | 0.02 | 30 | 200 | 762 | 1 | 0.0001 | 796 |
| Ethylbenzene | 1.0E+00 | 1.50 | 0.33 | 0.15 | 0.48 | 1.644 | 82.2 | 0.02 | 30 | 200 | 1524 | 1 | 0.323 | 0.726 |
| Toluene | 1.6E+00 | 1.50 | 0.33 | 0.15 | 0.48 | 1.644 | 82.2 | 0.02 | 30 | 200 | 1524 | 1 | 0.272 | 0.364 |

Notes:
Ks = Koc x foc (Equation R20)

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## RBCA Worksheet for steady-state attenuation - Equation R15

Cx/Csource =
EXP((X/(2 * alpha,x )) * (1 - ((1 + ((4 *lambda * alpha,x)/ U ))^0.5))) * @ERF(Sw /(4 * ((alpha,y * X )^0.5))) * @ERF(Sd /(2 * ((alpha,z * X )^0.5)))

| | Cx/ Csource (unitless) | X (cm) | U (cm/day) | alpha x (cm) | alpha y (cm) | alpha z (cm) | lambda (1/days) | Sw (cm) | Sd (cm) |
|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | |
| Benzene | 5.14E-05 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.0009 | 2438 | 304.8 |
| Benzo(a)anthracene | 2.08E-05 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.00051 | 762 | 60.96 |
| Ethylbenzene | 5.20E-09 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.003 | 762 | 91.44 |
| Toluene | 1.27E-14 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.011 | 1219 | 304.8 |

Note:
U =( K*i) /Ot (Equation R19)

## RBCA Worksheet for dissolved concentration along the centerline - Equation R26

Cx =
Csource * EXP((X/(2 * alpha,x )) * (1 - ((1 + ((4 *lambda * alpha,x)/ U ))^0.5))) * @ERF(Sw /(4 * ((alpha,y * X )^0.5))) * @ERF(Sd /(2 * ((alpha,z * X )^0.5)))

| | Cx (mg/L) | Csource (mg/L) | X (cm) | U (cm/day) | alpha x (cm) | alpha y (cm) | alpha z (cm) | lambda (1/days) | Sw (cm) | Sd (cm) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | | |
| Benzene | 0.00058 | 11.2 | 30480 | 3.425 | 3048 | 1016 | 152 | 0.0009 | 2438 | 305 |
| Benzo(a)anthracene | 6.03E-08 | 0.0029 | 30480 | 3.425 | 3048 | 1016 | 152 | 0.00051 | 762 | 61 |
| Ethylbenzene | 2.35E-09 | 0.452 | 30480 | 3.425 | 3048 | 1016 | 152 | 0.003 | 762 | 91 |
| Toluene | 1.80E-15 | 0.142 | 30480 | 3.425 | 3048 | 1016 | 152 | 0.011 | 1219 | 305 |

Notes:
U =( K*i) /Ot (Equation R19)
alpha x = 0.10 * X
alpha y = alpha x / 3
alpha z = alpha x / 20

## RBCA Worksheet for remediation objectives for groundwater at the source - Modified Equation R26

Csource =

Cx/ (EXP((X/(2 * alpha,x )) * (1 - ((1 + ((4 *lambda * alpha,x)/ U ))^0.5))) * @ERF(Sw /(4 * ((alpha,y * X )^0.5))) * @ERF(Sd /(2 * ((alpha,z * X )^0.5)))

| | Csource (Class 1) (mg/L) | Cx (Class 1) (mg/L) | Csource (Class 2) (mg/L) | Cx (Class 2) (mg/L) | X (cm) | U (cm/day) | alpha x (cm) | alpha y (cm) | alpha z (cm) | lambda (1/days) | Sw (cm) | Sd (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Organics** | | | | | | | | | | | | |
| Benzene | 97.31 | 0.005 | 4.87E+02 | 0.025 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.0009 | 2438 | 304.8 |
| Benzo(a)anthracene | 6.26 | 0.00013 | 3.13E+01 | 0.00065 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.00051 | 762 | 61.0 |
| Ethylbenzene | 1.35E+08 | 0.7 | 1.92E+08 | 1 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.003 | 762 | 91.4 |
| Toluene | 7.89E+13 | 1 | 1.97E+14 | 2.5 | 30480 | 3.43 | 3048 | 1016 | 152 | 0.011 | 1219 | 304.8 |

Notes:

RBCA Equation R26 was modified to determine allowable concentrations in groundwater at the source not to exceed groundwater objectives at the property line.

U =( K*i) /Ot (Equation R19)

alpha x = 0.10 * X

alpha y = alpha x / 3

alpha z = alpha x / 20

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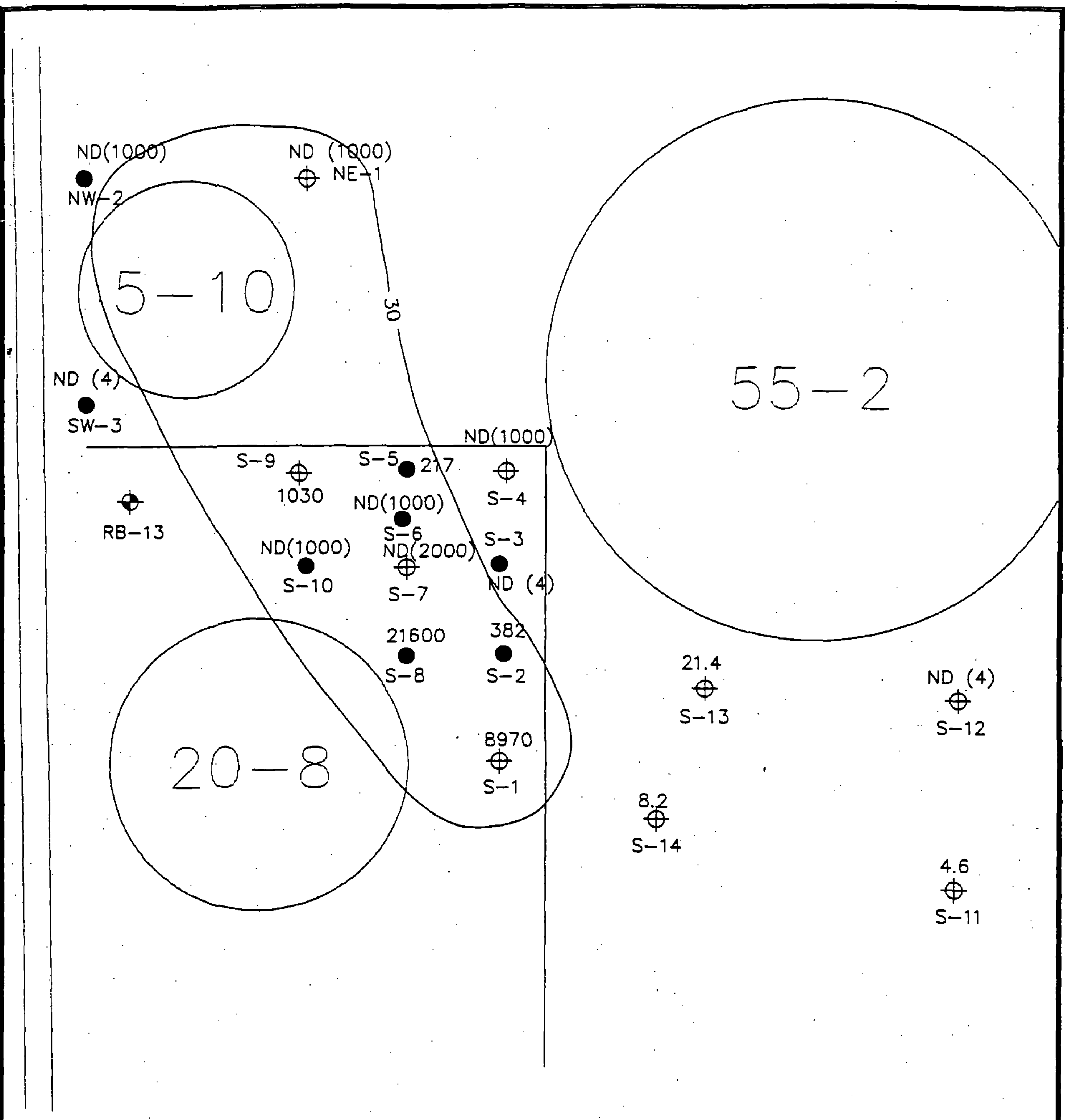
# APPENDIX A5
# SOURCE AREA ILLUSTRATIONS




*NOTE: Concentrations shown are maximum concentrations in each boring

25 0 25 50

SCALE IN FEET

## LEGEND

- SURFACE SOIL SAMPLE
- SURFACE/SUBSURFACE SAMPLES
- 21,600 BENZENE CONCENTRATION (ug/kg)
- MONITORING WELL

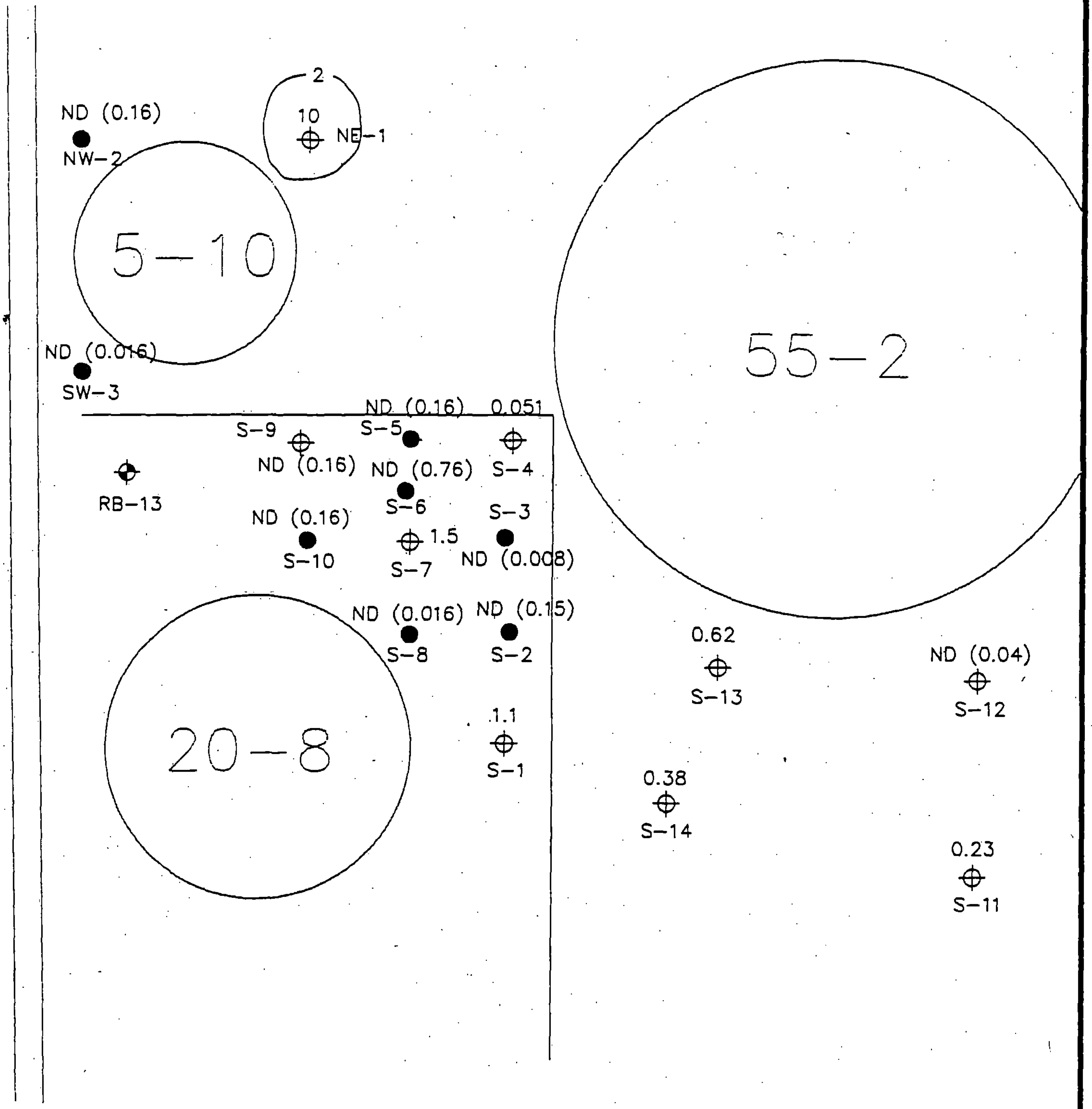
Burns & McDonnell Waste Consultants, Inc.

FIGURE A5-1

BENZENE CONCENTRATION IN SOIL

CLARK HARTFORD REFINERY

CLARK REFINING & MARKETING




*NOTE: Concentrations shown are maximum concentrations in each boring

25 0 25 50

SCALE IN FEET

LEGEND

● SURFACE SOIL SAMPLE

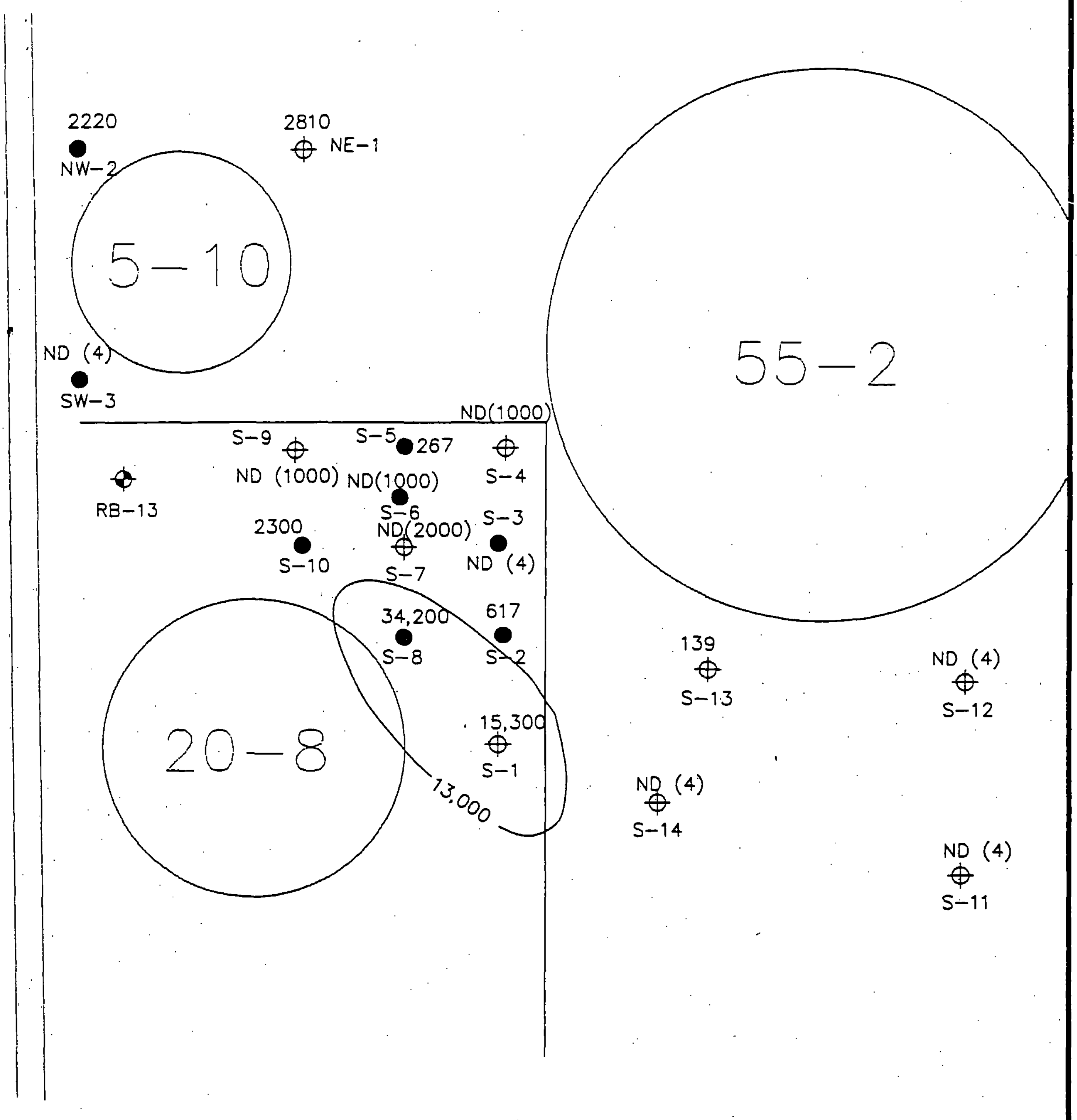
⊕ SURFACE/SUBSURFACE SAMPLES

1.5 BENZO(a)ANTHRACENE CONCENTRATION (ug/kg)

MONITORING WELL

Burns & McDonnell Waste Consultants, Inc.

FIGURE A5-2
BENZO(a)ANTRACENE
CONCENTRATION IN SOIL
CLARK HARTFORD REFINERY
CLARK REFINING & MARKETING




*NOTE: Concentrations shown are maximum concentrations in each boring

25 0 25 50

SCALE IN FEET

LEGEND

● SURFACE SOIL SAMPLE

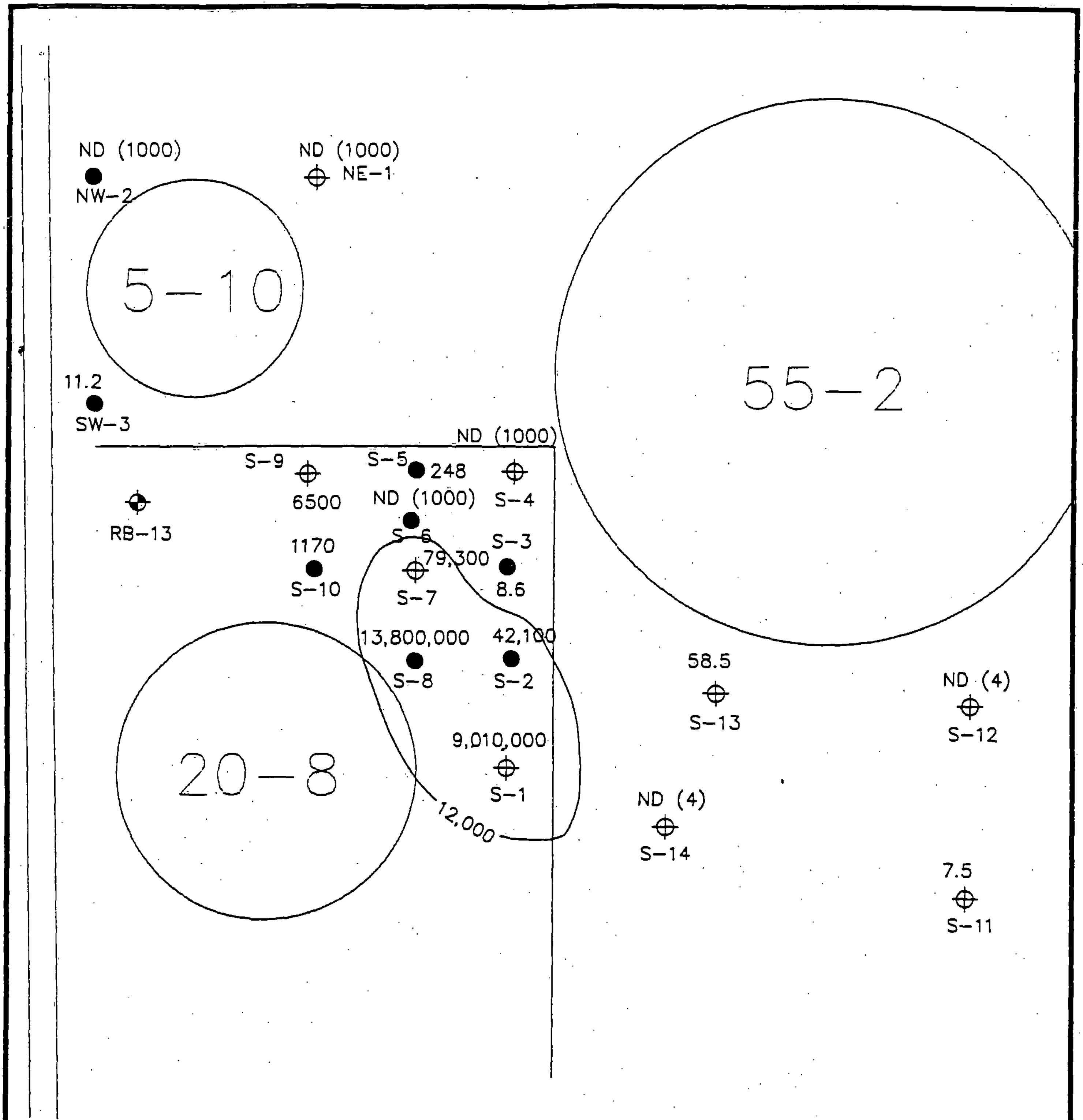
⊕ SURFACE/SUBSURFACE SAMPLES

15,300 ETHYLBENZENE CONCENTRATION (ug/kg)

MONITORING WELL

Burns & McDonnell Waste Consultants, Inc.

FIGURE A5-3
ETHYLBENZENE
CONCENTRATION IN SOIL
CLARK HARTFORD REFINERY
CLARK REFINING & MARKETING




*NOTE: Concentrations shown are maximum concentrations in each boring

25 0 25 50
SCALE IN FEET

## LEGEND

- ● SURFACE SOIL SAMPLE
- ⊕ SURFACE/SUBSURFACE SAMPLES
- 15,300 TOLUENE CONCENTRATION (ug/kg)
- ⊕ MONITORING WELL

Burns & McDonnell Waste Consultants, Inc.

FIGURE A5-4
TOLUENE
CONCENTRATION IN SOIL
CLARK HARTFORD REFINERY
CLARK REFINING & MARKETING

Clayton
GROUP SERVICES

# APPENDIX P-12

## CERCLA SCREENING SITE INSPECTION
## FEBRUARY 6, 1997

S. Prenco

CLARK OIL AND REFINING
LPC:1190500002
MADISON COUNTY
ILD:041889023
SUPERFUND/HRS
Date: 2-6-97

# CERCLA

# SCREENING SITE INSPECTION

# FOR

# CLARK OIL AND REFINING

[redacted]

CLARK OIL
HAWTHORNE ST
HARTFORD, IL.
62048

MADISON Co.
ILD 041889023
L 1190500002

SCREENED
MM

TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# I. INTRODUCTION

On December 11, 1990, the Illinois Environmental Protection Agency's Pre-Remedial Unit was tasked by the United States Environmental Protection Agency (U.S. EPA) to conduct a CERCLA Screening Site Inspection (SSI) of the Clark Oil and Refining Corporation/Wood River Refinery, Hartford, Illinois.

The site was initially placed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) by the U.S. EPA in August of 1980. This action was taken as a result of the concern over possible groundwater and surface water contamination due to operations at the facility.

An initial CERCLA evaluation, in the form of a Preliminary Assessment, was completed by Kenneth L. Page of the IEPA in January of 1986. IEPA's Pre-Remedial Unit prepared an SSI workplan for Clark Oil and Refining that was approved by the U.S. EPA's Region V office in December of 1990. The sampling portion of the Screening Site Inspection was conducted on December 11 and 12, 1990 when the sampling team collected a total of six groundwater and twelve soil samples.

The purpose of a Screening Site Inspection have been stated by the U.S. EPA in a directive that states:

> All sites will receive a screening SI to 1) collect additional data beyond the PA to enable a more refined preliminary HRS (Hazard Ranking System) score, 2) establish priorities among sites most likely to qualify for the NPL (National Priorities List), and 3) identify the most critical data requirements for the listing SI

step. A screening SI will not have rigorous data quality objectives (DQO's). Based on the Preliminary refined HRS score and other technical judgement factors, the site will either be designated as NFRAP (No Further Remedial Action Planned), or carried forward as an NPL listing candidate. A Listing SI will not automatically be done on these sites, however. First, they will go through a management evaluation to determine whether they can be addressed by another authority, such as RCRA [Resource Conservation and Recovery Act]... Sites that are designated NFRAP or deferred to other statutes are not candidates for a listing SI.

The listing SI will address all the data requirements of the revised HRS using field screening and NPL level DQO's. It may also provide needed data in a format to support remedial investigation workplan development. Only sites that appear to score high enough for listing and have not been deferred by another authority will receive a listing SI (U.S. EPA 1988).

U.S.EPA Region V has also instructed IEPA to identify sites during the SSI that may require removal action to remediate an immediate human health and/or environmental threat.

# 2. SITE BACKGROUND

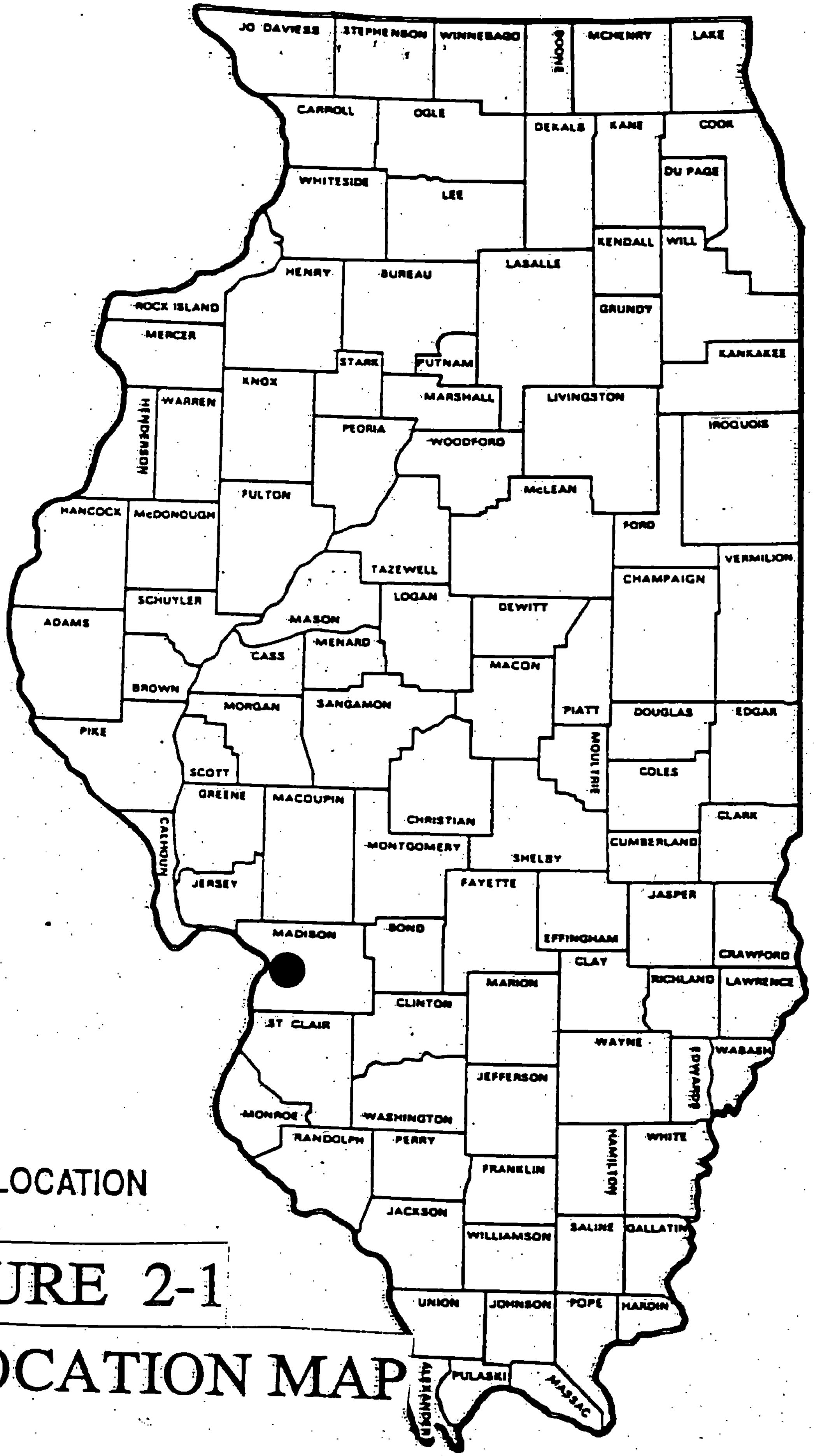
## 2.1 Introduction

This section contains a summary of information gathered from the Preliminary Assessment, Illinois Environmental Protection Agency (IEPA) files, and discussions with site representatives.

## 2.2 Site Description

The Clark Oil and Refining Corporation, Wood River Refinery is located in the Village of Hartford, Madison County, Illinois (Figures 2-1, 2-2 and 2-3). The refinery operations occupy approximately 253 acres located in the following sections: Sections 34 and 35, Township 5 North, Range 9 West; and Section 3, Township 4 North, Range 9 West. Clark Oil property also includes approximately 142 acres located in Section 33, Township 5 North, Range 9 West; and Section 4, Township 4 North, Range 9 West (See map located in Appendix C for features and property boundaries). A 4-mile radius map of the area surrounding the Clark Oil facility and a 15-mile surface water map can be found in Appendices A and B respectively.

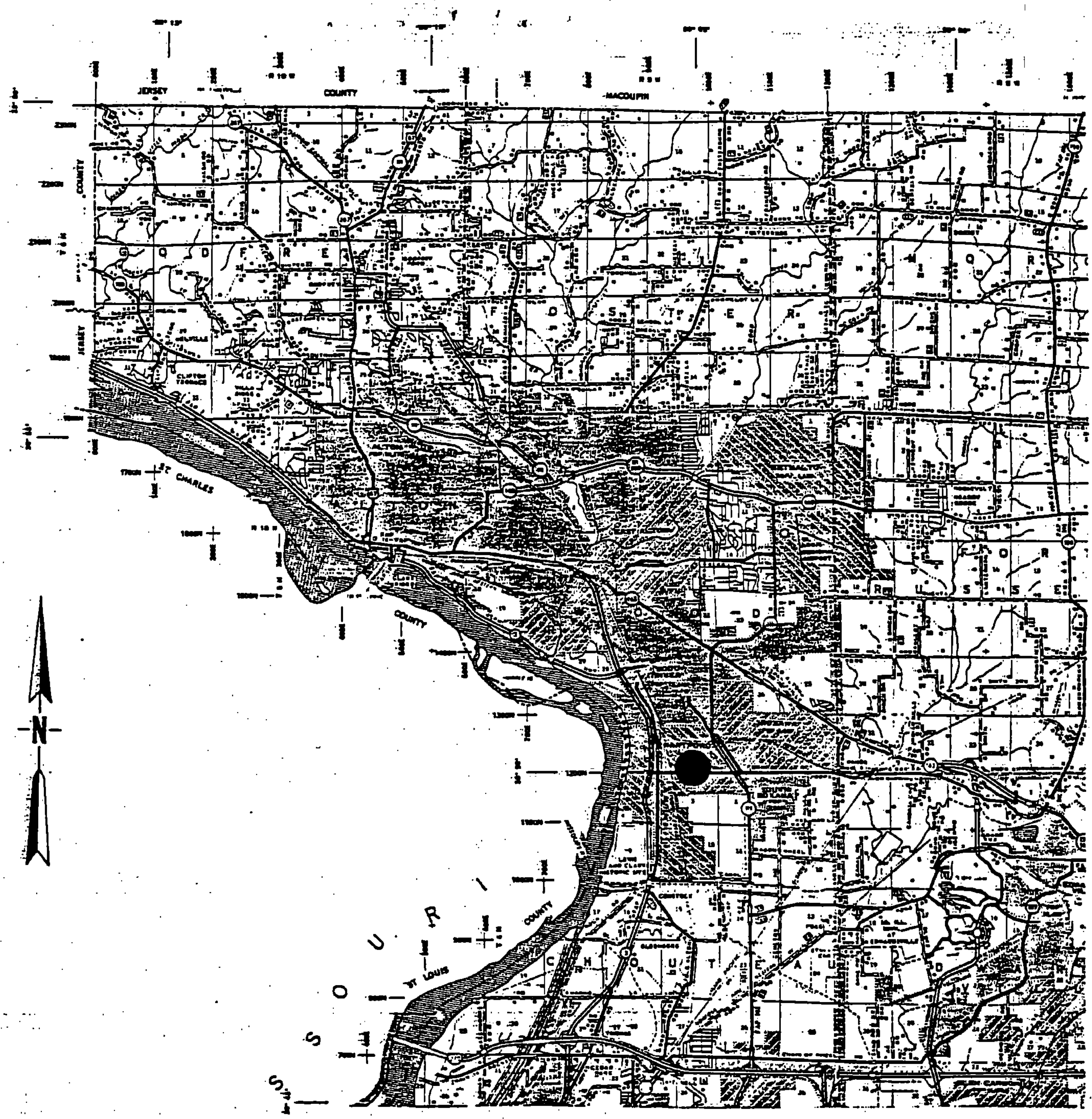
Clark Oil and Refining/Wood River Refinery is an operating petroleum refinery with an approximate plant capacity of 60,000 barrels a day. Process operations include crude desalting, atmospheric crude distillation, fluid catalytic cracking, hydrofluoric acid alkylation, vacuum distillation, hydroprocessing, and catalytic reforming. Products include gasoline (leaded gasoline production has been discontinued), LPG (liquid propane gas), distillate fuels, and coke.




● SITE LOCATION

# FIGURE 2-1

# SITE LOCATION MAP



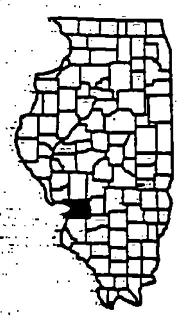
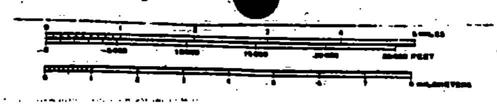



FIGURE 2-2

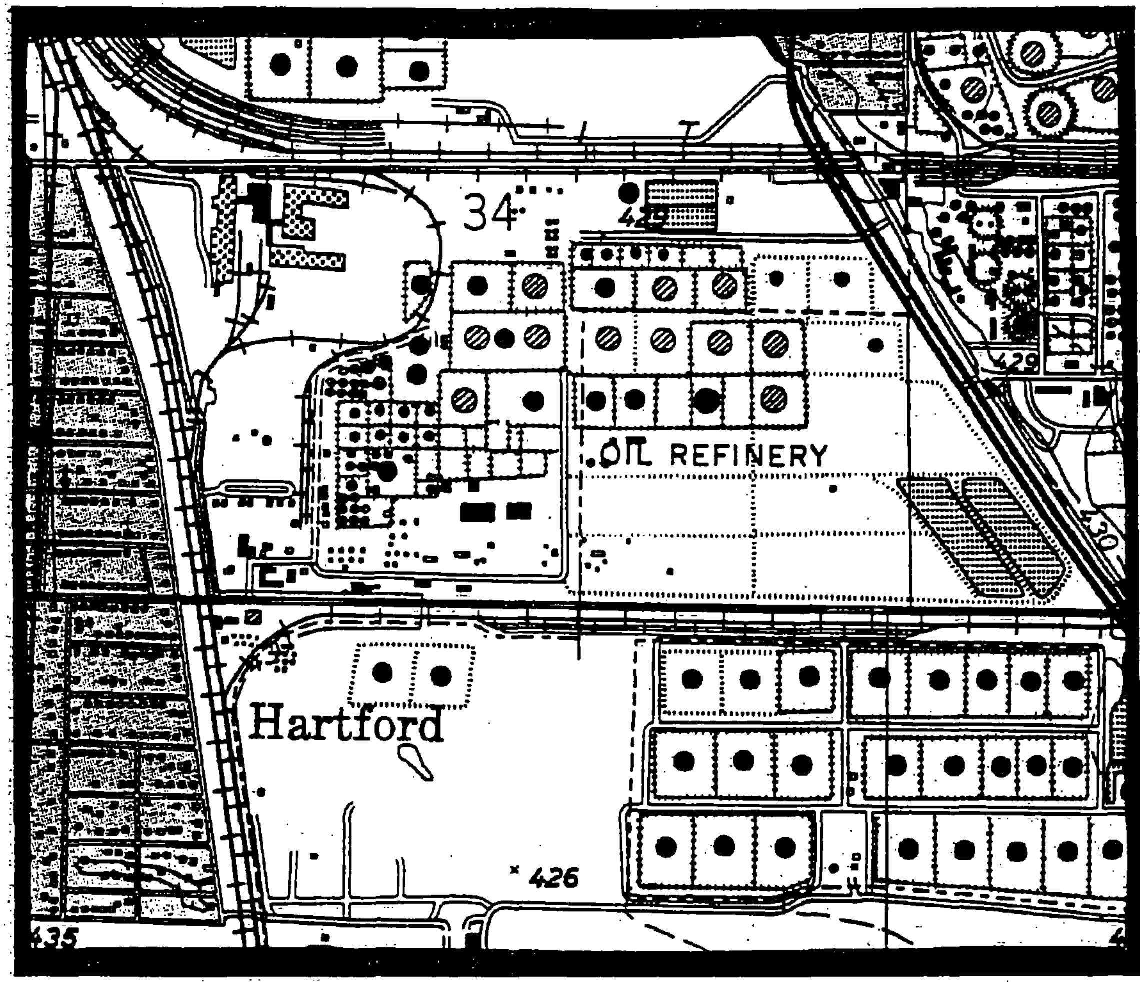
| ILLINOIS ENVIRONMENTAL PROTECTION AGENCY | SITE NAME: Clark Oil & Refining Corp. SITE ILD#: ILD041889023 |
|---|---|

REGIONAL AREA MAP

Legend: ● Site Location



Scale




Source: IEPA, 1992. Base Map: U.S.G.S. Topographic Map, 1974.

Approximate Scale: 1"= 2000'

# Figure 2-3
# SITE TOPOGRAPHY

Wastewater generated in the plant passes through various unit oil traps before combining at a master trap and going to an API oil-water separator. Flow then passes through a Dissolved Air Flotation (DAF) tank before entering a single stage extended aeration/nitrification activated sludge system. Effluent is then polished in dual media filters before being discharged into the Mississippi River via IEPA NPDES (National Pollutant Discharge Elimination System) permit #IL0001244.

The following wastestreams are generated as a result of the refinery's processes: DAF Float, Slop Oil Emulsions, Heat Exchanger Bundle Cleaning Sludge, and API Separator Sludge. Heat Exchanger Bundle Cleaning Sludge is processed through the wastewater treatment system described above. DAF Float, Slop Oil Emulsions, and API Separator Sludge are piped to above ground tanks. These wastes are then piped to a coking unit where they are processed into petroleum coke, coker gasoline, coker naphtha, coke fines, and gasoline oils. All of these materials are sold as products by Clark. Two other wastes are generated during routine turnaround periods: spent catalyst and wastewater treatment sludge. These wastes are categorized as non-hazardous. The spent catalyst is shipped to GSX-Barton (SW Permit #841332) and the waste water treatment sludge is shipped to the Peoria Disposal Company (SW Permit #941676).

An unlined lagoon serving as a stormwater retention basin is located at the intersection of Illinois Route 111 and Edwardsville Road. The basin (approximately 125,000 square feet) receives all site surface runoff and was exhibiting visual signs of hydrocarbon contamination during the October 30, 1990 reconnaissance inspection and the December 11-12, 1990 screening site inspection. An unlined pit containing crude oil tank bottoms is also present on the refinery property.

The refinery operation is bounded on the west by residential properties, on the south by agricultural and industrial property, on the east and north by industrial property (Shell Oil Refinery).

According to the IEPA Office of Chemical Safety and IEPA Technical Compliance files, a documented hydrocarbon plume is present on the groundwater in the City of Hartford and in the vicinity of Shell Oil and Clark Oil properties.

## 2.3 Site History

Clark Oil and Refining, Wood River Refinery began operations in 1941 as the Wood River Refinery. The facility became part of the Sinclair Oil Corporation in July, 1950. The refinery was purchased by Clark in September of 1960, sold to APEX in September of 1983, and repurchased by Clark on November of 1989.

The facility does not currently produce leaded gasoline and all leaded gasoline has been removed. Tetraethyl lead (TEL) was the anti-knock compound used by Clark in the production of leaded gasoline. All TEL has been removed, but the bulk storage area is still present, and according to Clark representative Richard Thomas, is currently awaiting contractor removal. Waste generated by the facility containing lead was handled as Leaded Tank Bottoms, and was shipped to an unknown location for off-site disposal. The last documented shipment of Leaded Tank Bottoms was in April, 1988.

Prior to the construction of the current wastewater treatment system, all wastewater passed through various oil traps and a filter system. The effluent was then piped to a 3-stage lagoon system located just west of the levee and north of Hawthorne Street (see Appendix B). The effluent, after passing through the lagoons, was discharged to the Mississippi River.

Clark Oil property west of the levee and south of Hawthorn Street was the site of an illegal dump according to IEPA FOS files. In 1976, an asbestos-like substance and an unidentified sludge-like material was observed at this site.

The DAF Float, Slop Oil Emulsions, and API Separator Sludge wastestreams, reused to produce petroleum coke, were pumped to Tank 10-2 for temporary storage (see facility map located in Appendix C). Tank 10-2 had been in use for approximately 48 years and had been documented by IEPA's Collinsville Field Operations Section in Collinsville personnel lacking adequate secondary containment and exhibiting visual contamination within the earthen berm surrounding the tank. Tank 10-2 underwent closure activities in June, 1989. A total of 297 tons of sludge from tank cleanout and removal and 409 tons of waste/soil from within the earthen berm were fixed and shipped by Chemical Waste Management to their Emelle, Alabama, landfill. The remaining soil inside the berm was then treated with microbes.

## 2.4 APPLICABILITY OF OTHER STATUTES

This section discusses the applicability of any other Environmental statutes with regards to Clark Oil and Refining. The Clark Oil facility is considered to be a "full quantity" generator under the Resource Conservation and Recovery Act (RCRA) program according to the Federal listing of RCRA related facilities published by the Region V offices. However, Clark Oil does not hold a permit from the IEPA. Clark filed a "Raw Materials Storage" RCRA part A permit application on November 17, 1980, which Clark then withdrew on November 23, 1982. The withdrawal of the application was approved by the U.S. EPA on December 15, 1983.

With the exception of the DAF Float, Slop Oil Emulsions, Heat Exchanger Bundle Sludge, and API Separator Sludge, products at Clark are exempt from CERCLA due to the Petroleum Exclusion. The groundwater contamination problems in the Hartford area also fall under the Petroleum Exclusion.

# 3. SITE INSPECTION ACTIVITIES AND ANALYTICAL RESULTS

## 3.1 Introduction

This section outlines procedures utilized and observations made during the CERCLA Screening Site Inspection conducted at the Clark Oil/Wood River Refinery on December 11 and 12, 1990. Specific portions of this section contain information pertaining to the reconnaissance inspection and sampling procedures. This section also details the analytical results with particular emphasis upon the Key samples.

The Screening Site Inspection for Clark Oil/Wood River Refinery was conducted in accordance with the site inspection workplan which was developed and submitted to the U.S. EPA Region V offices prior to the initiation of sampling activities.

## 3.2 Reconnaissance Inspection

IEPA personnel conducted a reconnaissance inspection of the Clark Oil and Refining Corporation and the surrounding area on October 30, 1990. The inspection included a walk-through of the refinery operations area and the lagoon area west of the levee to identify potential sampling locations and appropriate health and safety requirements. Mr. Richard Thomas and Mr. Joe Bean accompanied IEPA personnel on the inspection and were able to answer the questions.

Several observations were made by Agency personnel during this visit.

The refinery operations area is enclosed by a chainlink fence with full-time security personnel present at entrance points. The facility is bounded to the west by the Village of Hartford, the north and east by Shell Oil Company, the south by Shell Oil property and agricultural land.

The lagoon area west of the levee does not have restricted access, and Mr. Thomas stated that people have been seen fishing there from time to time. The southwest portion of this area is bounded by NICOR National Shipyard and lagoons, the west by the Mississippi River, the north by Shell Oil property, and the east by the levee and Illinois Rt. 3. Clark Oil also operates a barge loading pipeline transfer station at the west edge of this property on the banks of the river.

### 3.3 Site Representative Interview

The site representative interview was conducted on October 30, 1990, between Mr. Todd Buchanan of the IEPA and Mr. Joe Bean of Clark Oil and Refining Corporation. The meeting was arranged to explain the Pre-remedial process to the Clark representatives and to confirm the SSI schedule and objectives. During this interview Mr. Buchanan indicated that the inspection would include the collection of ten on-site and two off-site soil/sediment samples and three on-site and three off-site groundwater samples. Mr. Thomas stated that the company wished to split samples at this time.

## 3.4 Soil/Sediment Sampling

A total of twelve soil/sediment samples were collected during the SSI at Clark Oil (See Figures 3-1 and 3-2 for soil/sediment sampling locations). All samples were collected using stainless steel spoons and hand augers with the soil/sediment being transferred directly to the sample jars and packed in accordance with the U.S. EPA required procedures. Table 3-1 outlines the sampling activity.

Table 3-1

Soil/Sediment Sampling

Soil/Sediment samples collected on December 11, 1990:

X101

| Time | Depth | Location |
|---|---|---|
| 8:45a | 2-3' | N side of TEL storage building, 72.4' S of S corner post of the RR gate and 149' from corner post of site boundary fence. |

X102

| | | |
|---|---|---|
| 9:15a | 1-1.5' | SE of TEL bldg., 72.8' W of foam valve and 66.6' NW of RR switch. |

X104

| | | |
|---|---|---|
| 9:55a | 0-6" | Inside berm of leaded tanks 35-1 and 35-2, 26.8" SE of tank 35-2 manhole and 48.9' S of tank mixer. |

X105

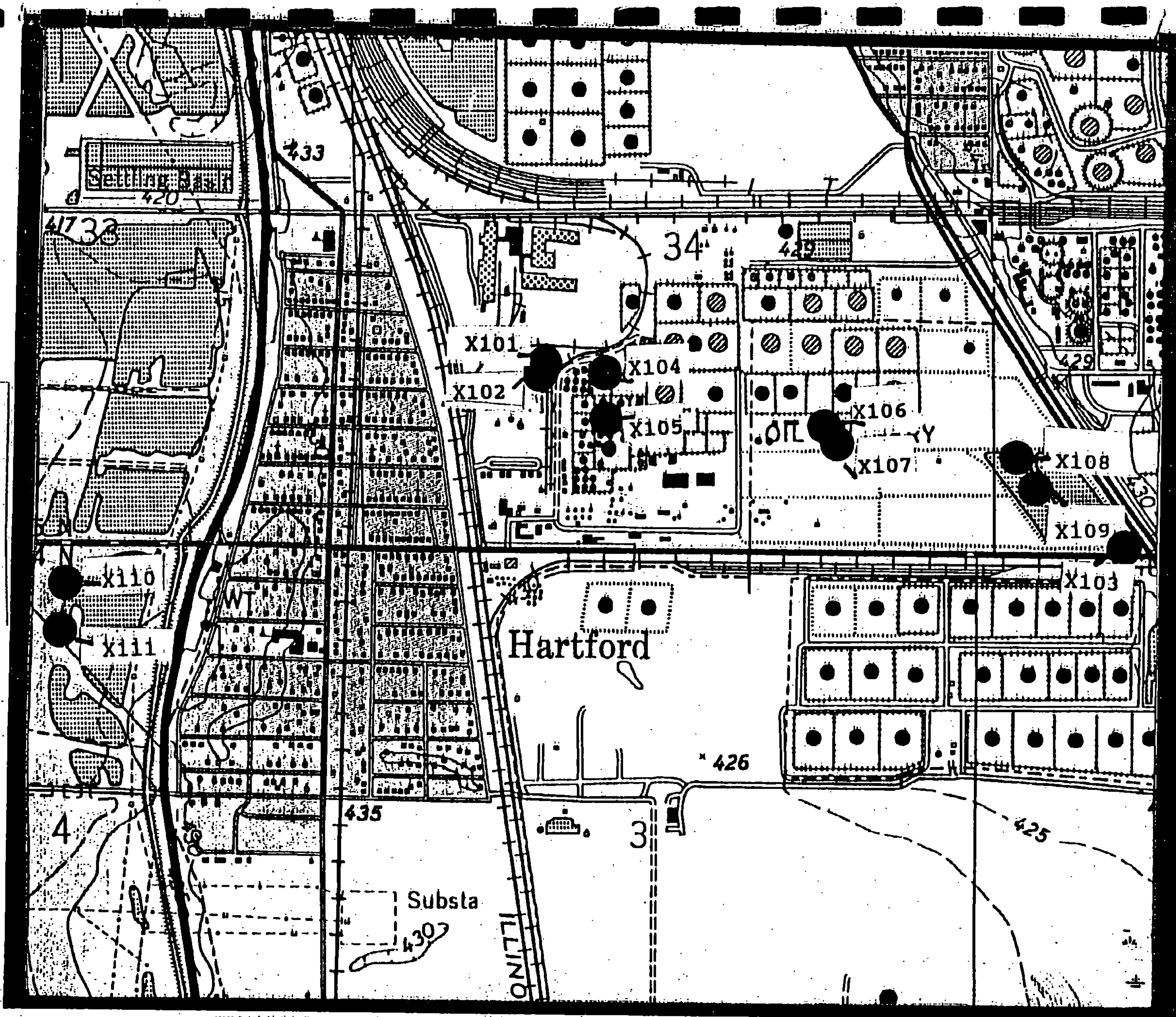
| | | |
|---|---|---|
| 10:20a | 0-6" | NW corner of bermed area former site of 10-2. |

# SOIL/SEDIMENT SAMPLING LOCATIONS

Figure 3-1

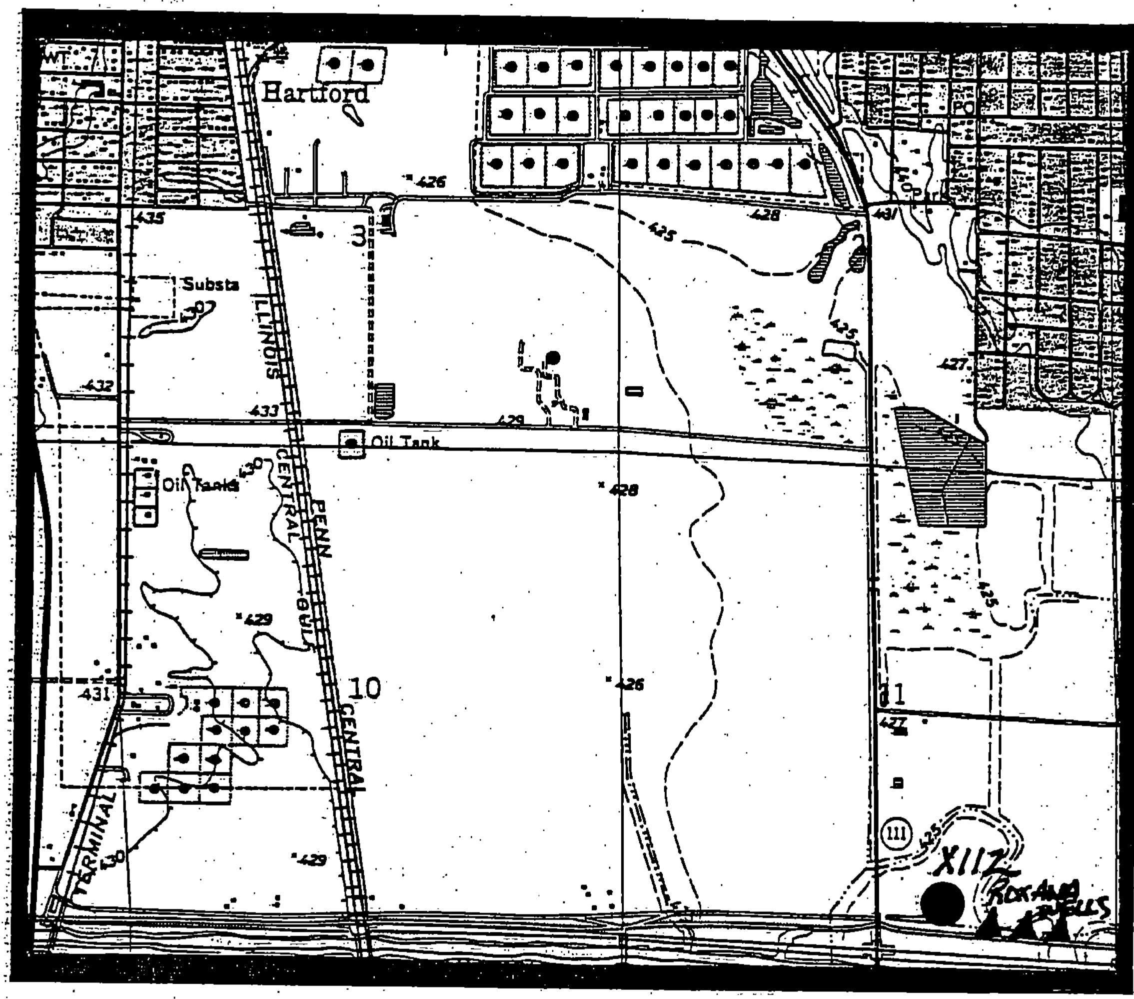
CERCLA Screening Site Inspection: Clark Oil & Refining Corp.

3-4




Source: IEPA, 1992. Base Map: U.S.G.S. Topographic Map, 1974
Approximate Scale: 1"= 1123'

3-4




Source: IEPA, 1992. Base Map: U.S.G.S. Topographic Map, 1974.

Approximate Scale: 1"= 2000'

# Figure 3-2
# BACKGROUND SOIL SAMPLE

Soil/Sediment samples taken on December 12, 1990:

X103
2:55p 0-6" Offsite roadside drainage ditch near junction of Rt. 111 and 11A, 9.8' S of SE site corner post.

X106
10:25a. 0-6" 8' from SE corner of berm, tank bottoms pit.

X107
10:50a. 3-3.5' Along west bank, 40' N of SW corner of tank bottoms pit.

X108
12:20p 1.5-2' N bank near inlet pipe of storm water retention basin. 74.5' E of NE corner of concrete skimmer base and 62.5' SW of nearby fire hydrant.

X109
12:45p 2' NW point of E bank of retention basin, 8' from bank.

X110
1:45p 2-2.5' NE corner of 1st stage lagoon near abandoned effluent discharge pipe 86' SW of SW corner of power line tower 108' W of orange gas line marker.

X111
2:20p 1' W of pond S of Hawthorn Street, site of former illegal dump, 139' SW of SW corner of power line tower.

X112
8:40a 6" Base of levee, N slope, approx. 300 yds. E of Rt. 111 near Roxana water plant.

Standard IEPA decontamination procedures were followed prior tothe collection of all samples. The procedures included the scrubbing of all equipment (spoons, pans, etc.) with a non-foaming Trisodium Phosphate solution, rinsing with hot tap water, rinsing with acetone, rinsing with hot tap water again, and final rinsed with distilled water. All equipment was air dried, then wrapped and stored in heavy-duty aluminum foil for transport to the field. Field decontamination procedures included all of the above except the hot tap water rinse.

## 3.5 Groundwater Sampling

Three on-site monitoring wells and three off-site public wells were sampled to determine if compounds found on the Target Compound List (TCL) have been released to groundwater (See Figure 3-2 for sampling locations). The monitor wells had 3 well volumes purged, with pH, conductivity and temperature measured. Each well was hand sampled with a Teflon bailer using nylon cord and was field filtered for total metals with a Masterflex variable speed peristaltic pump and filter stand with filters. Directly after sampling each point, preservatives were added to appropriate bottles and were packed according to U.S.EPA required procedures.

The three public wells sampled (Identified in Figure 3-2, as G501, G502, and G503) were pumped for a minimum of fifteen minutes prior to sampling with pH, conductivity, and temperature readings taken. The well samples were taken at the respective well heads prior to any treatment or filtering and were field filtered for heavy metals. The following table outlines groundwater sampling activities:

Table 3-2

<u>Groundwater Sampling</u>Groundwater samples collected on December 11, 1990:

<u>G101</u>

| Time | Depth | |
|---|---|---|
| 11:25a | 50.5' | NW part of refinery area near TEL storage building (monitor well). |

G104
3:35p 100' SE of cooling tower #2 (monitor well).

G501
4:45p 107' Hartford PW #3.

G502
5:05p 106' Hartford PW #4.

Groundwater Samples collected on 12-12-90:

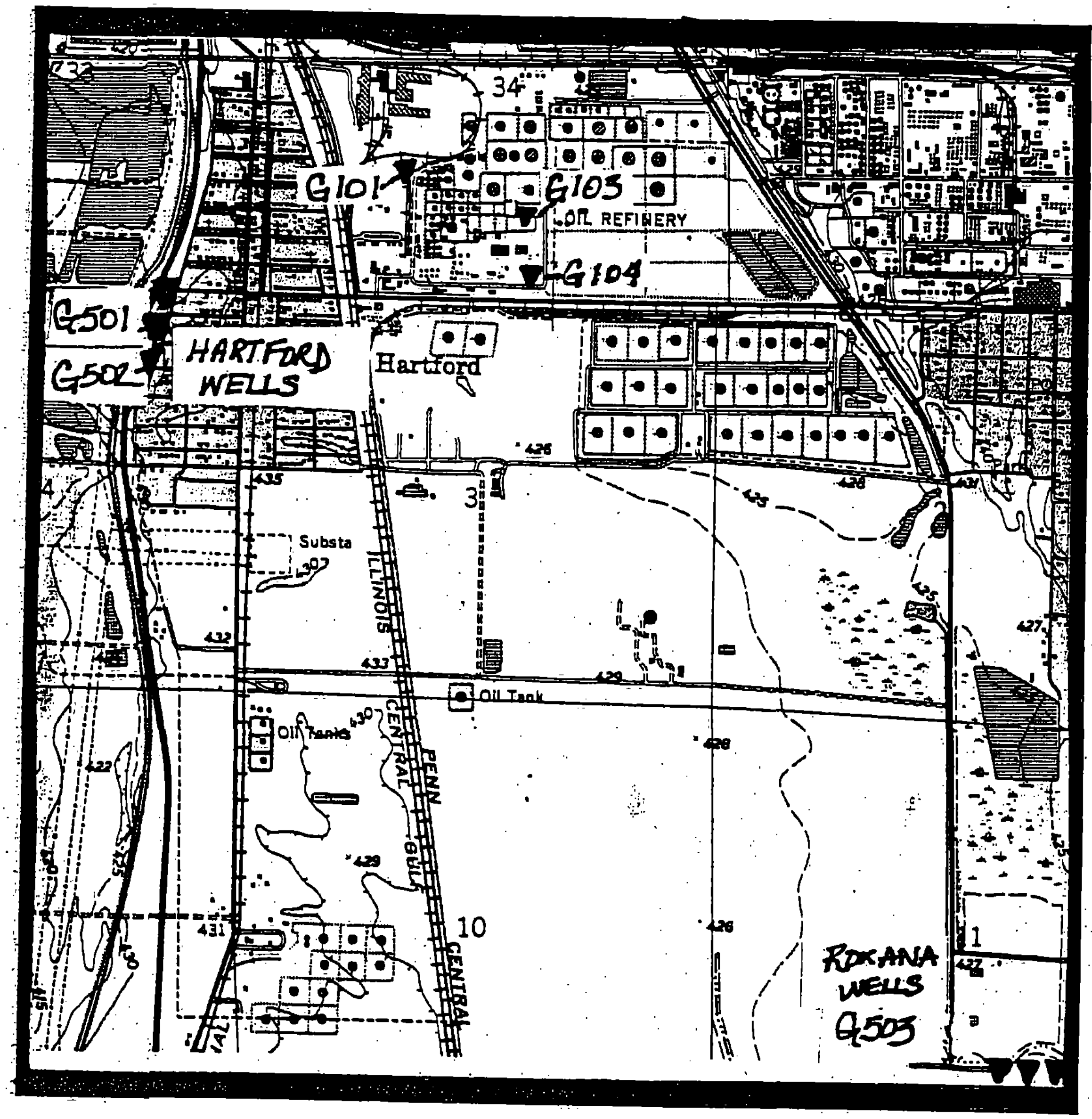
G103
11:30a 97.2' 3' E of valve tower and 4' S of cover of process well #3.

G503
8:45a 110' Roxana PW #8.

Standard IEPA decontamination procedures were followed prior to the collection of all samples. The procedures included the scrubbing of all equipment (bailers, buckets, etc.) with a non-foaming Trisodium Phosphate solution, rinsing with hot tap water, rinsing with acetone, rinsing with hot tap water again, and final rinsed with distilled water. All equipment was air dried, then wrapped and stored in heavy-duty aluminum foil for transport to the field. Field decontamination procedures included all of the above except the hot tap water rinse.

## 3.6 Analytical Results

Chemical analysis of the twelve soil/sediment samples collected during the inspection revealed the presence of the following substances: volatiles, semi-volatiles, pesticides, metals, suspected laboratory artifacts, and common inorganic soil constituents (See Figure 3-1 for sampling locations). Chemical analysis of the six groundwater samples also showed




Source: IEPA, 1992. Base Map: U.S.G.S. Topographic Map, 1974.

Approximate Scale: 1"= 1992'

# Figure 3-3

# GROUNDWATER SAMPLING LOCATIONS

the presence of volatiles, semi-volatiles, pesticides, metals, laboratory artifacts, and common inorganic groundwater constituents (See Table 3-2 for sampling locations). Table 3-3 provides a summary of results. Complete results can be found in Volume II of this report.

### 3.7 Key Samples

Tables 3-4 and 3-5 identify those samples taken during the CERCLA Screening Site Inspection (SSI) which were shown to contain contaminants at levels which were significantly higher than those of background concentrations.

For a review of all contaminants detected in samples taken during the CERCLA SSI, the reader is referred to the Sample Summary Table located in the front of Volume II of this report.

# 4. IDENTIFICATION OF SOURCES

## 4.1 Introduction

In this section the author will briefly discuss the various hazardous waste sources which have been identified in the initial stages of the CERCLA site investigation.

Information concerning the size, volume, and waste composition of each source has been derived throughout the initial site assessment, reconnaissance visits, and the screening site inspection sampling action. It should be pointed out, however, that the total number and nature of
each of the sources identified below may be subject to change, as the site progresses through the CERCLA site investigation program and receives further investigation.
Figure 4-1 provides a map for source location information.

## 4.2 TEL Storage Building

Tetra-ethyl lead was used by Clark Oil as an anti-knock compound in the production of leaded gasoline. TEL was stored from this 800 square foot building located in the northwest corner of the facility (see Appendix C). All TEL has been removed, however, the bulk storage area remains and is awaiting removal by a contractor. Storage capacity of the building is unknown. Samples taken from the north and south sides of the building contained analytically significant levels of numerous volatiles, naphthalene, and cobalt (see Table 3-4). Pathways of concern include groundwater and soil exposure.

### 4.3 Leaded Tanks (35-1 and 35-2)

Leaded tanks 35-1 and 35-2 are located in the northwest corner of the facility approximately 380 feet east of the TEL storage building. The tanks are surrounded by an unlined berm, approximately 500 square feet in area. Sample results from the inspection showed analytically significant levels of numerous volatiles, semi-volatiles, Heptachlor, and metals (see Table 3-4).

### 4.4 Tank 10-2

Tank 10-2 had been in use for 48 years, and had stored DAF Float, Slop Oil Emulsions, and API Separator Sludge. These wastes had been pumped into Tank 10-2 from the wastewater treatment process, and were reused by Clark in the production of petroleum coke. The field operations office in Collinsville had reported that the bermed area lacked adequate secondary containment. Visable contamination within the bermed area was noted in February of 1989.

Clark stated in a letter to this Agency in March of 1989 that the tank was no longer in operation and that a complete clean-up of the tank and contaminated soil was to be completed in May, 1989.

A sample taken in the northwest corner of the bermed area showed analytically significant levels of Pyrene, Benzo(a)Anthracene, Endosulfan II, Cobalt and Mercury (see Table 3-4). Pathways of concern include: groundwater and soil exposure.

### 4.5 Tank Bottoms Pit

The tank bottoms pit is unlined and is located near the northeast corner of the facility and is approximately 7000 square feet in area. Analytically significant levels of volatiles, semi-volatiles, Endosulfan II, and metals (see Table 3-4 were detected in the samples.

Pathways of concern include groundwater and soil exposure.

### 4.6 Stormwater Retention Basin

The stormwater retention basin is located at the eastern boundary of the facility and occupies an area of approximately 125,000 square feet. The unlined basin catches runoff from the facility. Visual signs of hydrocarbon contamination were apparent during the reconnaissance inspection conducted on October 30, 1990.

Analytically significant levels of acetone and metals were detected in the sample taken from the north bank of the retention basin near the inlet pipe. High levels of volatiles, semi-volatiles, and metals were detected in the sample taken at the northwest point of the east bank of the basin (see Table 3-4).

Pathways of concern include: groundwater and soil exposure pathway (workers on-site), and the surface water pathway for the environmental threat (the Illinois Department of Conservation's National Wetland Inventory maps have designated this area, as well as several others at this site as wetlands.

## 4.7 Former Treatment Lagoons

Clark Oil used three lagoons located west of the levee and south of Hawthorne Street for treatment of wastewater prior to the construction of the current treatment facility. The lagoons received effluent from Clark's oil traps and filter system. Effluent was then discharged to the Mississippi River from these lagoons. Volume of these lagoons is unknown, and is dependent upon the level of the river.

Analytically significant levels of metals were detected in the sample taken from the northeast corner of the first stage lagoon near an abandoned effluent discharge pipe (see Table 3-4).

Pathways of concern is groundwater, and surface water-including the environmental threat that these metals may pose, and also drinking water due to the number of intakes located downstream from these lagoons. The threat to the human food chain is also a potential threat.

## 4.8 Illegal Dumpsite

Located west of the lagoon system, this area was used by Clark for demolition debris, however, an unknown sludge was reported present by the Collinsville field office on December 14, 1978. Clark Oil was informed by the Agency that they were in violation of Agency regulations.

Analytically significant levels of volatiles, semi-volatiles, and metals were detected in samples collected in December of 1990.

Pathways of concern include: groundwater and surface water.

## 5.0 MIGRATION PATHWAYS

### 5.1 Introduction

This section discusses data and information that apply to potential migration pathways and targets of TCL compounds that can be attributed to Clark Oil and Refining Corporation. The pathways of concern are groundwater, surface water, and soil exposure (direct contact). The air migration pathway is also noted.

### 5.2 Groundwater Pathway

The Groundwater Migration Pathway is of concern at this site due to the potential for the contaminants that have been released during spills and leaks to the soil to find their way into the groundwater system.

Geologic and hydrogeologic information was made available through Illinois State Water Survey (ISWS) well logs, Illinois State Geological Survey reports, and IEPA files.

Clark Oil and Refining Corporation/Wood River Refinery, is located in the Mississippi River Valley of the East St. Louis area commonly referred to as the "American Bottoms". Water-yielding deposits of the area are permeable sands and gravels in unconsolidated valley fill. In the vicinity of the site, the upper 20 to 30 feet consists of silts and clays with discontinuous sand lenses present in some areas, with materials coarsening with depth. The most favorable water-yielding deposits usually occur at depths of 60 to 90 feet. Studies of the aquifer suggest a hydraulic conductivity of

2,000 gallons/day from a saturated thickness of 75 to 100 feet.

The aquifer of concern consists of the entire unconsolidated alluvial deposits overlaying the limestone bedrock of the area.

The direction of groundwater flow in the refinery operations area is to the southeast. Flow in this area is artificially influenced by industrial well withdrawals, with lesser cones of depression located within the regional flow regime. Flow direction in the lagoon areas to the west of the levee is to the east, also artificially induced by pumpage with some recharge expected from the Mississippi River.

There are four public water supply systems utilizing the aquifer of concern within a four mile radius of the site (see Appendix A for public well locations). The Village of Hartford has four municipal wells serving 1,900 people, five Wood River wells supply 12,446 people, three Roxana wells serve 3,873 people and seven Bethalto well serve 22,783 residents. Located less than four miles from the site is East Alton's well field serving 7096 people. The five above mentioned municipalities distribution systems are all interconnected and with the addition of the few area residents using private wells brings the total population potentially affected by groundwater to approximately 62,424. A listing of the number of public wells and approximate number of private wells and users in each distance category are identified below.

| Distance | Wells | Private Well Population | Total Population |
|---|---|---|---|
| 0-1/4 mile | 0 | 0 | 0 |
| 1/4-1/2 mile | 0 | 0 | 0 |
| 1/2-1 mile | 9 | 8 | 1918 |
| 1-2 miles | 21 | 50 | 1308 |
| 2-3 miles | 165 | 595 | 40,034 |
| 3-4 miles | 130 | 316 | 20,422 |

## 5.3 Surface Water

Clark Oil and Refining's property west of the levee and Hartford is situated in the 30-year floodplain of the Mississippi River between the Mississippi River mile 196 and 198. According to the St. Louis District of the Army Corps of Engineers, the highest river stage on record occurred in April of 1973. During this time the lagoons became a part of the river as the stage crested at 431.3 feet. The predicted 30-year, 100-year, and 500-year flood events would reach a maximum elevation at river mile 197 of 434 feet, 436.8 feet, and 441.5 feet respectively.

Two surface water intakes are located downstream of Clark Oil. Illinois-American Water Company has an intake 4.5 miles downriver near Mississippi River mile 192. The St. Louis intake is located north of river mile 190, 6.2 miles downriver (see Appendix B). Collectively, these intakes supply millions of people with water.

Pool 27 of the Mississippi River is used extensively for fishing and recreational purposes according to the Illinois State Atlas.

The illegal dump and the former treatment lagoons are sources that could contribute to contaminants entering the surface water pathway. Of concern in this pathway are the drinking water intakes that are located downstream, most notably, those used by the City of St. Louis.

The Environmental threat is also of concern at this source. According to maps by the U.S. Department of the Interior, this lagoon area, located west of the levee, is a noted wetland area. And, as was noted previously, Clark representatives have stated that people have been seen fishing in the lagoon area.

According to maps received from the Illinois Department of Conservation, National Wetlands Inventory, there are also designated wetland areas in the storm water retention ponds, as well as several other areas within the operations area.

## 5.4 Air

Releases to the air were observed during the SSI while collecting soil/sediment and groundwater samples. Upwind and downwind air samples of the facility failed to document an observed release. A photo-ionization detector (HNU) with an 11.7 eV lamp was used to screen the soil/sediment samples and groundwater samples and monitor for any air releases.

Approximately 34,000 people live within four miles of Clark Oil and Refining.

The following table provides information concerning populations located within a 4-mile radius of the Clark Oil facility.

| Distance | Population |
|---|---|
| Greater than 0-1/4 mile | 0 |
| Greater than 1/4-1/2 mile | 40 |
| Greater than 1/2-1 mile | 3817 |
| Greater than 1-2 miles | 10398 |
| Greater than 2-3 miles | 10359 |
| Greater than 3-4 miles | 13817 |

## 5.5 Soil Exposure

The soil exposure threat to the approximately 500 Clark workers within the operations area of the facility at Clark. However, direct exposure by the public is not of concern in the operations area of the facility due to the area being fenced and the security guards located at the entrance. The lagoon areas west of the levee, however, do not have access control and Clark Oil representatives stated that people have been seen fishing in the lagoons on Clark property.

Approximately 2,000 people live within one mile of the lagoon area west of the levee.

## 6. BIBLIOGRAPHY

Gary, James H. and Handwerk, Glenn E. Petroleum Refining: Technology and Economics. Marcel Dekker, Inc., New York, New York, 1984.

Illinois Department of Conservation, National Wetlands Inventory Map, 1988, Wood River 7.5 Minute Quadrangle.

Illinois Environmental Protection Agency, 1986, Potential Hazardous Waste Site Assessment for Clark Oil & Refining Corporation ILD041889023, prepared by Kenneth L. Page, Springfield, Illinois.

Illinois Environmental Protection Agency, Bureau of Land, file for Clark Oil & Refining Corporation, L1190500002.

Illinois Environmental Protection Agency, Bureau of Water, file for Clark Oil & Refining Corporation.

U.S. Environmental Protection Agency, Resource Conservation and Recovery Act (RCRA) status list, March 25, 1992.

U.S. Census Bureau, 1990, Average persons per household in Madison County, Illinois.

USGS, 1974, Wood River, IL. Quadrangle, 7.5 Minute Series.

USGS, 1974, Bethalto, IL. Quadrangle, 7.5 Minute Series.

# APPENDIX P-13

## EXPANDED SITE INSPECTION REPORT
## SEPTEMBER 2001

Source: IEPA BOL

L1190500002 – Madison Co.
CLARK OIL & REFINING COMPANY
ILD041869023
HRS/SF

(Volume 1 of 2)

# CERCLA

## Expanded Site Inspection

Illinois Environmental
Protection Agency

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EXPANDED SITE INSPECTION REPORT
CLARK OIL & REFINING COMPANY

## TABLE OF CONTENTS

EXPANDED SITE INSPECTION REPORT

for:

CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

ILD 041869023

PREPARED BY:
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
BUREAU OF LAND
FEDERAL SITE REMEDIATION SECTION
SITE ASSESSMENT UNIT

SEPTEMBER 2001

## TABLE OF CONTENTS(cont.)

## APPENDICES

# 1.0 SITE BACKGROUND

## 1.1 INTRODUCTION

On September 30, 2000, the Illinois Environmental Protection Agency's (IEPA) Site Assessment Program was tasked by the U.S. Environmental Protection Agency (U.S. EPA) to conduct an Expanded Site Investigation (ESI) of the Clark Oil & Refining Company (currently named Premcor (The Premcor Refining Group Inc.)) (ILD041869023) site located in Hartford, Illinois. The ESI is performed under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986.

On August 3, 1991 Clark Oil was placed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) in response to concerns that past and current site activities may have resulted in the release of chemical substances, associated with oil refining processes, into the environment. The substances had the potential to enter the environment through four environmental pathways; groundwater, surface water, soil exposure and air releases thereby endangering the life and health of wildlife and human populations. The potential for contamination exists both onsite and in nearby offsite locations. This potential stems from a number of factors as follows: The refinery has been active as a refinery for over 60 years; disposal of leaded still bottoms on site in unlined pits; the occurrence of multiple leaks and spills, free product existing on groundwater beneath the site and local residences west of site; disposal of various production wastes in an unlined landfill area on Clark Oil property west of the Army Corp of Engineers flood control levee; two of Hartford's public drinking water wells have been found to be contaminated with various volatile organic compounds including BTEX constituents.

The Illinois EPA conducted a Preliminary Assessment at the site on June 4, 1992 and a Screening Site Inspection on March 31 and April 1, 1993. Personnel of Illinois EPA's Site Assessment Unit prepared a work plan for ESI field activities, which was submitted to U.S. EPA on October 17, 2000. The field activity portion of the ESI was conducted on November 1, 2, and 9, 2000. The activities of the ESI included a reconnaissance inspection, an internal file review, information collected from external sources and the collection of thirty soil samples. Twenty-eight samples were collected from Clark Oil & Refining property; two (the soil background) were collected on Roxanna Water Department property. No sediment or groundwater samples were collected during the November 1, 2 and 9, 2000 sampling event. However, twenty-four groundwater samples (monitor wells) were collected from plant property on May 21 - 23, 2001 by personnel from the IEPA's Collinsville field office. Samples were collected in conjunction with Clark Oil's quarterly groundwater sampling requirement. Duplicate and background samples of each media are included in the number of samples mentioned above.

The Illinois EPA performed ESI activities at the site to fill information gaps which existed from previous CERCLA investigations and to determine whether, or to what extent, the site poses a threat to human health and the environment. The ESI report presents the results of Illinois EPA's evaluation and summarizes the site conditions and targets of concern to the migration and exposure pathways associated with the site.

## 1.2 SITE DESCRIPTION

The Clark Oil & Refining site is located at the east corporate boundary of the City of

Hartford, Illinois on property with the address of 201 East Hawthorne South (State Aid Route 11A) Wood River Township, Madison County (Figures 1 & 2). The site is an operating petroleum refinery, which consists of numerous process structures, piping, and holding tanks for crude oil and finished product. Clark Oil & Refining Company is one of three oil refineries in the immediate area east and north of the Village of Hartford. General land use surrounding the residential areas of the Village is industrial. A few commercial businesses are located within Hartford. Refinery property encompasses a total of approximately 420 acres. Refinery operations occupy approximately 270 acres west of Illinois Route 111 and east of the Village of Hartford. Refinery operations are located in Sections 34 and 35 Township 5 North - Range 9 West and Section 3 Township 4 North - Range 9 West. Clark Oil property also includes old wastewater treatment lagoons located on approximately 150 acres west of refinery operations and west of the Corp of Engineers Mississippi River flood control levee. Three and one half of the four lagoons on this property currently contain water. Half of the fourth lagoon has been utilized as a repository for the Village of Hartford's landscape waste and light demolition debris. This property is located in Section 33 Township 5 North - Range 9 West and Section 4 Township 4 North - Range 9 West. The refining processes portion of Clark Oil property is situated in the S 1/2 of Section 34 T.5N. - R.9W. and the SW 1/4, SW 1/4 of Section 35 T.5N. - R.9W. (Figure 2). This portion of the property lies within the eastern corporate limits of Hartford. Bordering the refinery portion of the site to the north is the Illinois Terminal Railroad across which is the Amoco Oil Refinery, south by Hawthorne Street (State Aid Route 11A) across which is one of Shell Oils' tank farms, east by Illinois Route 111 across which is the Shell Oil Refinery and west by the Penn Central, Burlington Northern, and Illinois Central Gulf Railroads beyond which is the Village of Hartford. The old wastewater treatment lagoons are situated in SW 1/4, SE 1/4 of Section 33 T.5N. - R. 9W. and the W 1/2, NE 1/4 of Section 4 T.4N. - R.9W. (Figure 2). This property lies west of the Hartford corporate limits and west of Route 3. Bordering this portion of Clark property to the north are settling basins who's owner is unknown by this author, south by open ground, east by the Mississippi River flood control levee, and west by the Mississippi River. The Clark Oil & Refinery site is situated in an area that has been used as industrial or commercial since the early 1900's. Residential property exists to the north-northeast (Wood River and Roxana), west and southwest (Hartford), and southeast South Roxana) of the refinery property. Single-family residences make up the majority of the residential property within four miles of Clark Oil. Multi-family dwellings are interspersed within these urban residential areas. Also, some areas near the Clark refinery remain as pasture or farmland, generally south, southwest, and southeast.

Clark Oil & Refining has been active as a refinery since 1941. Current site structures remain in use and considered to be in good operating condition. The company is an operating petroleum refinery with process operations including crude desalting, atmospheric crude distillation, and fluid catalytic cracking, etc. Products include gasoline (formerly producing leaded gasoline), LPG, distillate fuels and coke. Wastewater generated at the plant passes through various settling basins, skimmers and treatment processes prior to being discharged into the Mississippi River. The discharge is regulated by a National Pollutant Discharge Elimination System (NPDES) permit issued by the IEPA. Waste streams generated by the refinery processes are DAF float, slop oil emulsions, heat exchanger bundle cleaning sludge, and API separator sludge. These wastes are then processed into various materials and sold by Clark. Another waste stream formerly generated by Clark was leaded tank bottoms. During the time period of leaded gasoline production, storage tanks were routinely cleaned when empty. The leaded tank bottom sludge was cleaned from the bottom of these tanks and placed in an unlined pit on refinery property to dewater and dry. The pit remains and consistently contains water.

The majority of the sites ground surface consists of soil, weeds, cinders, white gravel, asphalt and concrete. Soil, grass and white gravel comprise the secondary containment berms surrounding the facility's storage tanks. Landscaping at the main office building consists of a small amount of grass with some bushes and trees. The old wastewater treatment lagoons remain in existence and contain water of unknown depth. Currently these lagoons have approximately four feet of freeboard. Berms are constructed of soil covered with grass, with various areas protected by rock rip-rap at the normal pool elevation.

The nearest individual and occupied structure is located off site. The structure, along with a number of others immediately adjacent to the refinery, is a single-family residence located approximately 300 feet west of the refinery's western property boundary. Additional residential areas exist west, north, and southeast of Clark. The Mississippi River is located approximately 800 feet west of the old lagoons and approximately 4000 feet west of the western property boundary of the refinery process area.

Surface water runoff from the refinery is collected in either area drains or open channels and routed to the Guard Basin at the southeast portion of the facility. Skimmers then remove any grease or oil from the water surface. Water in the Guard Basin is used as the refinery's fire protection reservoir. A 15-mile surface water drainage route map identifying surface water migration is provided in Appendix A. Appendix A also provides a 4-mile radius groundwater migration map identifying areas of potential impact.

The Clark Oil refinery property is entirely fenced with an eight-foot high chain link fence topped with three strands of barbed wire. An electronic main access gate is actuated by a guard 24 hours a day. The Clark Oil refinery property can be accessed only after a visitor contacts an employee from the main office, the visitor signs in, attends a company safety training class (good for one year), and is escorted throughout the facility.

While walking both Clark property locations, air monitoring was conducted by use of a Foxboro Toxic Vapor Analyzer (TVA) meter. Monitoring of the breathing zone and near the soil surface occasionally registered two or three meter units above background readings (1 - 2 meter units) at the refinery and no readings above background at the old wastewater treatment lagoons. No peculiar or extremely unusual site characteristics were noted during the survey. Further inspection of the old wastewater treatment lagoons revealed signs of recreational use on this property, ie; discarded fishing tackle, deposits of beverage containers, cigarettes, etc. Signs of animals were also present on this property. At this time, consideration of the lagoons as a fishery is speculative. The fill area on the southern most lagoon, as mentioned previously, remains active. Refuse consisted mainly of gravel, broken concrete, and soil.

Surface soil on the refinery property consists of silty clay, silty sand and sandy clay. Gravel and or cinders cover this soil in a number of locations on this property. The soil surface surrounding the lagoon property consists of silty loam, silty clay, silty sand and sandy clay. In some locations gravel had been placed on the soil surface. West of the lagoons and extending approximately six hundred feet west toward the Mississippi River is an area of overgrown vegetation, timber and bushes.

The Clark Oil & Refining Company property is located in an area of southwestern central Illinois where surficial terrain has been shaped by various types of glacial action and deposition, and riverine dynamics and morphology. The land surface has been modified by glacial activity into the gently rolling terrain surrounding the Mississippi River flood plain. Modifying this terrain was the transport of glacial outwash and the meandering of the Mississippi River to form Mississippi River flood plain referred to as the American Bottoms. The refinery property is flat and lies at approximately 428 feet above mean sea level (MSL). The topography surrounding the property is also relatively flat and lies at basically the same distance above MSL. The lagoon property is also flat and lies at approximately 415 feet above MSL. Normal pool elevation of the Mississippi River is 398 feet above MSL. Site slope is basically non-perceptible for the majority of the site. Surface drainage follows minor site slopes to area drains, open channels or pools in place. Although much of the moisture on site does drain to designated locations a large amount also infiltrates into the sandy soil and into area groundwater. As previously mentioned, all site runoff flows into the Guard Basin.

Industry and commercial properties within close proximity of Clark Oil & Refining are Shell Oil Refinery to the north; Amoco Oil Refinery and above ground storage tank farm (tank farm), east and northeast; Shell Oil tank farm, south-southeast; various commercial businesses in South Roxana, southeast; and various commercial businesses in Hartford, west. Overall land use within the four-mile radius of Clark Oil is predominantly rural. However, within 1 mile of the Clark property land use is approximately seventy-five percent industrial.

## 1.3 SITE HISTORY

Clark Oil & Refining Company began operations in 1941 as the Wood River Refinery. The facility became part of the Sinclair Oil Corporation in July 1950. Clark purchased the refinery property in September 1960. In September 1983 Clark sold the facility to APEX Corporation and then repurchased it in November 1989. In May 2000, the company changed its name and currently, the facility is known as Premcor.

Review of a number of aerial photographs dating from 1954 to 1990 has revealed a number of areas of potential contamination. The photos show areas of various size which, over the years, have been subjected to leaks, spills, surface disposal etc. Since 1970 and the creation of the EPA, Clark has completed necessary remediation of said spills, leaks, etc. However, according to groundwater monitoring well sample results, free product (leaded gasoline) is floating on the water table beneath Clark and the Village of Hartford. The free product has been attributed to Clark through analytical fingerprinting. It remains unclear as to when and how the product migrated from Clark.

According to the State Historical Library's Incorporation Documents, Clark Oil & Refining Company was incorporated to conduct refining of crude oil into gasoline products and to sell such products. As noted previously, Clark has operated as a refinery from 1941 to the present. The Hartford refinery through a series of improvements and expansions, has reached a crude oil throughput capacity of approximately 70,000 barrels per day. Because the refinery includes a coker unit it therefore has the capability to process a high percentage of lower cost, heavy sour crude oil into higher value products such as gasoline and diesel fuel along other with other petroleum products distributed on a wholesale unbranded basis. In addition to heavy sour crude the refinery units also process light sweet crude oil. The Clark Oil & Refining Company's Hartford facility produces the following motor fuels; conventional gasoline, reformulated gasoline, #1 diesel and #2 diesel fuel. Each product is monitored throughout the production and blending process by obtaining samples and testing for octane (cetane index for diesel), vapor pressure (cold flow properties for diesel), and distillation. Once a refinery tank is full, the batch is mixed for several hours to ensure homogeneity. Composite samples are then pulled and tested for necessary properties. When the product is determined to be "on-test" for all properties, the tank is certified and released for shipment. Clarks' reformulated gasoline is produced by ethanol blending and does not use MTBE in the production of this fuel.

There is no evidence that Clark used any type of containment system to prevent the migration of contaminants into the environment from wastes placed into pits or on the ground surface. Complaints registered by area residents and businesses have been regarding the presence of gasoline fumes in basements and contaminated groundwater.

## 1.4 REGULATORY STATUS

Clark Oil & Refining Company has had numerous complaints registered against it, mainly due to gasoline fumes in basements. The facility is not subject to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), Atomic Energy Act (AEA), or Uranium Mine Tailings Radiation Control Act (UMTRCA).

# 2.0 EXPANDED SITE INSPECTION ACTIVITIES

## 2.1 INTRODUCTION

This section contains information gathered during the preparation of the formal CERCLA Expanded Site Inspection and previous Illinois Environmental Protection Agency's activities involving the Clark Oil & Refining Company site. Specific activities included an internal file search, field reconnaissance inspections, site representative interviews, and a sampling visit of the surrounding area and the facility.

## 2.2 RECONNAISSANCE ACTIVITIES

On October 26, 2000, personnel of Illinois EPA's Site Assessment Unit conducted a reconnaissance inspection of the Clark Oil & Refining Company property and surrounding area. Upon arrival at the main office, located near the southwest corner of the refinery property, contact was made with the plant manager. Introductions took place followed by a short discussion regarding the purpose of the reconnaissance and that the sampling team would be utilizing the Agency's Geoprobe to obtain soil samples on the property. The plant manager and the author then proceeded to tour the refinery. Activity at the refinery was noted to be normal. Three shifts keep the refinery in operation twenty-four hours a day. Employees were noted to be performing routine plant maintenance, monitoring production processes or working in various production process areas. Modes of employee transportation at the refinery other than walking are bicycle or automobile/truck. Hard Hat, steel toe and shank footwear and fire-retardant jumpsuits are required to be worn when on refinery property within the fence line. All fencing around the refinery is well maintained. As the reconnaissance progressed the author and plant manager placed wooden stakes at potential sample locations throughout the refinery (and later at the old lagoon property). Due to the use of the Geoprobe, once the locations were marked, plant engineering investigated each specific location to assure no underground utilities or piping was present. If the location was deemed clear it was certified and tagged as an acceptable sample location. When the reconnaissance at the refinery property was completed, the plant manager and the author proceeded to the old lagoon property. No fencing exists around the lagoons. The author did not note any unusual characteristics regarding the lagoons. Potential sample locations were marked and handled in the same manner in which the refinery locations were handled. Other areas investigated during the reconnaissance were the surface water drainage routes leading from the property, residential areas near the site, the proximity of the properties to the Mississippi River, and on-site soils. The information attained during the reconnaissance and additional information gathered on November 1, 2 & 9, 2000 is included in the site description in Section 1.2 of this report.

## 2.3 REPRESENTATIVE INTERVIEWS

Site representative interviews were conducted on various occasions over the telephone between personnel of the IEPA, and the refinery manager of Clark Oil & Refining Company during October and November 2000 prior to the site inspection. Another short interview with an employee of Clark Oil was conducted on November 1, 2000 just prior to the actual site inspection sampling activities. The interviews were conducted to inform the site representatives of IEPA's intentions, to talk about past, present and future activities and problems, explain the CERCLA site assessment process, and to confirm proposed sampling locations. The plans involved the collection of 30 soil/sediment samples (which includes a duplicate sample) from on and off site. A number of these samples will be described as shallow, others will be described as deep. Samples were to be collected by utilizing IEPA's Geoprobe, a direct push technology; stainless steel bucket auger or stainless steel trowel. The type of equipment used to collect the samples depended on the various sample locations and location characteristics on and off site. Each sample location was chosen to determine if contamination existed in shallow or deep strata or at a specific area on refinery and lagoon property and whether a contaminant was attributable to Clark. The Geoprobe, in addition to obtaining shallow soil samples, was to be used to collect soil samples at depths of between 20'-30' in order to determine if contaminants were present in native soil beneath the refinery and old lagoon property. The Geoprobe was also used to determine if contaminants were present at or near the water table. After confirming the sample locations for the site representative the sampling team was given the company safety training after which began the site sampling process. The plant manager was also asked whether any mishaps occurring on-site. He indicated that various minor incidents have occurred over the past few years. The IEPA inspection team leader and the refinery manager also discussed the various types of contaminants that were potentially present on-site due to past and current refinery operations. He was informed that chemical constituents may include various heavy metal, PNA, PAH and volatile compounds.

## 2.4 SAMPLING ACTIVITIES AND RESULTS

On November 1, 2 & 9, 2000, Illinois EPA personnel collected thirty samples from within the Clark Oil property and immediate area surrounding the property. Samples collected consisted of twenty-eight soil samples from within the property boundaries of Clark, and two soil samples off-property. The two off-property samples (one shallow and deep in the same Geoprobe bore hole) serve as background samples. The on-property samples were collected to help determine the type of contaminants present and concentration of the contaminants. The off-property soil background sample was collected to serve as a baseline for constituents which may be common in area soils. Additional discussions concerning the analytical results of these samples and their impact on the various migration pathways may be found in Section 4.0 of this ESI report (Migration Pathways). Figures 4 & 5 illustrate the locations of each soil sample. Table 9 describes each soil sample with its location, depth, and physical appearance. Tables 1 - 4 provide an overall summary of soil samples collected during this ESI investigation. Tables 5 - 8 (Soil Key Sample Summary Tables) provides a summary of key soil samples depicting contaminants detected at concentrations at least three times background levels.

Groundwater samples were not scheduled to be collected at the time of this investigation. Prior to the sampling event discussions within the IEPA determined that IEPA's Collinsville Field Operations Section staff would conduct groundwater sampling which would take place during quarterly sampling of Clarks monitor well system. Previously conducted site investigations have determined groundwater flow direction to be, generally, in a northeasterly direction.

The twenty-eight soil samples collected from Clark Oil property revealed elevated levels of several volatile constituents, a number of semi-volatile constituents, and several pesticide and inorganic constituents. All soil samples were analyzed for the Target Compound List constituents. Samples X125 (shallow) & X126 (deep) were designated as background soil samples. Due to similar constituent quantities reported by the analytical laboratories in these two samples all comparative analysis of samples will be compared to background sample X125. All samples except X119 and X128 contain various volatile constituents at levels equal to or greater than three times background levels (Tables 5). None of the constituents exceed USEPA designated Removal Action Level (RAL) benchmarks, however, the level of benzene exceeds the Superfund Chemical Data Matrix (SCDM) benchmark in sample X130. Samples X102, X103, X105 - X108, X110, X112, X114 - X120, X122 - X124, and X128 - X130 contain various semi-volatile constituents at levels equal to or greater than three times background levels (Table 6). None of the constituents exceed RAL's, however, the level of benzo(a)pyrene exceeds the SCDM benchmark in samples X103, X110, X112, X114, X116 - X120, and X124. San X104, X107, X108, X110, X112, X114, X116 - X120, X122, X124, and X129 pesticide/PCB constituents at levels equal to or greater than three times backgr 7). None of the constituents exceed RAL's, however, the level of dieldrin, 4'4- 1254 in sample X103; aldrin in sample X112; dieldin in sample X114; heptach sample X118; and aroclor-1254 in sample X124 exceeds the SCDM benchmarks. Samples X102 - X104, X106, X107, X110, X112 - X118, X120, X124, X127, X128, and X130 contain various inorganic constituents at levels equal to or greater than three times background levels (Table 8). None of the constituents exceed RAL's except cadmium in sample X112. The SCDM benchmark for beryllium is exceeded by all samples except samples X101 and X112. The SCDM benchmark for manganese is exceeded in sample X113. All other constituents are below SCDM benchmarks.

There were no sediment samples or groundwater samples collected during this sampling event. Groundwater samples were, however, collected by IEPA's Collinsville FOS staff on March 2001.

Groundwater sampling consisted of collecting samples from twenty-four monitor well locations on the Clark Oil Refinery portion of the property. All groundwater samples were analyzed for the Target Compound List constituents. Monitor wells are distributed throughout the refinery property. Groundwater elevations were also determined during this sampling event, the resultant groundwater flow direction was found to be in a northeast trend. A complete report of groundwater conditions on Clark property including analytical data will be completed in early November, 2001. Initial information supplied by the Collinsville field office indicates most monitor wells contained free hydrocarbon product floating on groundwater. Groundwater static level during the May sampling event was approximately thirty feet below ground surface. Information on contaminants and contaminant levels were not available at the time of this writing.

For a list of semi-volatile compounds considered to be polynuclear aromatic hydrocarbons (PNA's), please refer to the Target Compound List found in Appendix B.

A complete analytical data package for the Clark Oil & Refining Company site is located in Appendix D, under a separate cover in Volume 2 of the ESI report.

Photos of IEPA=s November 2000 sampling event are located in Appendix C of this report.

## 3.0 SITE SOURCES

### 3.1 CONTAMINATED SOIL (ON CLARK OIL REFINERY & LAGOON PROPERTY)

During the November 2000 ESI sampling event twenty-eight soil samples were collected from various locations on the Clark Oil & Refining Company property. Analysis of the collected samples indicated various contaminants above background concentrations with some being three or more times above background concentrations (reference Tables 5 - 8). In addition to the 2000 samples, sample analysis from various previous sampling events were utilized to define sources and determine soil contaminant concentrations. Samples utilized for determining the contaminated soil source were collected at various depths within Clark Oil property. According to the HRS definition of a source when referring to contaminated soil, any area where a hazardous substance has been deposited, stored, disposed, or placed, plus those soils that have become contaminated from the migration of a hazardous substance is considered a source. Based on this definition, sample data and measurements from known points of contamination, the source has been calculated to be an area of approximately two hundred acres (8,712,000 square feet).

### 3.2 SURFACE IMPOUNDMENT (TANK BOTTOM PIT)

The subject surface impoundment is triangular in shape located slightly northeast of the center of the refinery portion of the property. This impoundment is unlined and contains leaded tank bottom sludge from storage tank cleanout. At the time of the November 2000 sampling event the sludge was covered with approximately six inches to one foot of water. The impoundment was also noted to have approximately two feet of freeboard remaining. During the November 2000 investigation a sample (X114) was collected from the surface of the sludge below six inches of water. Analytical results of the sample indicated the presence of constituents from each, the volatile, semivolatile, pesticide/PCB and inorganic fractions of the TCL. A few of the constituent concentrations are three times above background (reference Tables 5 - 8). This source has been calculated to contain a volume of approximately 34,322 cubic feet. Volume was calculated with the formula 1/2 (Base x Height) x Depth. 1/2 (131' x 131') x 4' = 34,322'.

## 3.3 SURFACE IMPOUNDMENTS (OLD WASTEWATER TREATMENT LAGOONS)

The subject surface impoundments are rectangular in shape located west of the refinery portion of the property, west of the Corp of Engineers Flood Control Levee on both, the north and south side of Hawthorne Road. The impoundments were once a three-stage lagoon wastewater treatment system for Clark Oil. The impoundments are unlined and contain material which has either been pumped or placed into them by Clark. At the time of the November 2000 sampling event the lagoons contained water, however depth was not determined. The impoundments were also noted to have approximately four to six feet of freeboard remaining. During the November 2000 investigation a samples (X101 - X104 & X127 & X128) were collected from the bermed areas surrounding the lagoons. Analytical results of the samples indicated the presence of constituents from each, the volatile, semivolatile, pesticide/PCB and inorganic fractions of the TCL. A few of the constituent concentrations are three times above background (reference Tables 5 - 8). This source has been calculated to contain a volume of approximately 150 acres.

## 3.3 PLUME OF CONTAMINATED GROUNDWATER

According to the HRS definition of characterizing a source when referring to a plume of contaminated groundwater resulting from an unknown source(s), the plume of contamination must be identified by sampling and inference, using observed release criteria along with a level of effort similar to an ESI, to possibly identify the original source(s). Sample data from several site investigations and required quarterly sampling of monitor wells by Clark Oil has indicated that the plume extends from beneath the Clark Oil refinery portion of the property, west and northwest to beneath the Village of Hartford. Based on the definition, sample data available, and measurements from known points of contamination the source has been calculated to cover an area of approximately fifty acres (2,178,000 square feet).

# 4.0 MIGRATION PATHWAYS

## 4.1 GROUNDWATER

According to the Illinois State Geological Survey and the Illinois State Water Survey the Clark Oil & Refining facility is situated on what is locally known as the American Bottoms otherwise known as the Cahokia Alluvium. The Cahokia consists of approximately forty-five feet of silt, clay, and silty sand, overlying sixty to ninety feet of sand and gravel glacial outwash of the Mackinaw Member of the Henry Formation. The Mackinaw Member is Wisconsinan in age and is glacial outwash in the form of valley-train deposits. Underlying the alluvium and outwash is Pennsylvanian and Mississippian age limestone and dolomite with lesser amounts of sandstone and shale. The Cahokia Alluvium consists of unconsolidated, poorly sorted, fine-grained materials with some local sand and clay lenses. This material becomes coarser with depth. This material was laid down via flood events, eolian activity, bank slumping, and erosion and deposited material from tributary streams. The Mississippi River has frequently and extensively altered this material. The Mackinaw Member consists of materials which are generally medium to coarse sand and gravel and, as does the Cahokia Alluvium, also increases in grain size with depth. Till and/or boulder zones may be encountered ten to fifteen feet above bedrock. The Ste. Genevieve Limestone, underlying the Mackinaw Member, consists of limestone, dolomite, sandstone and shale. Sandstone and sandy limestone are present mainly in thin beds. This formation is approximately eighty feet thick in the area near the Clark facility. Underlying the Ste. Genevieve Limestone is the St. Louis Limestone consisting mainly of fine-grained, cherty limestone but also containing beds of dolomite, crystalline limestone, fossiliferous limestone and evaporates. The St. Louis Limestone is approximately two hundred feet thick in the area beneath Clark Oil in Hartford.

All of the Formations and associated Members are hydrologically connected in this area. Groundwater movement beneath the Clark Oil facility and surrounding area tends to reflect the river stage of the Mississippi River. Groundwater has been determined to trend toward the east and northeast when prolonged periods of high river stage exists and toward the west and southwest when the river stage is at normal pool or below. During the May 2001 groundwater investigation at the Clark Oil refinery property, groundwater was encountered at approximately thirty feet below ground surface (BGS) upon initial measurement of monitor wells prior to bailing and sampling. Monitor wells vary in total depth from forty feet to sixty feet below ground surface. Land surface elevation throughout the refinery portion of the property is approximately 428 feet above mean sea level (MSL). Groundwater in the shallow alluvial and sand and gravel outwash aquifer may ultimately discharge into nearby streams and wells with some movement into the deeper bedrock formations. Flow direction of groundwater in local bedrock follows eroded bedrock surfaces at depth, which dip toward the west and along old eroded valleys as indicated by the Illinois State Water Survey Bulletin 60-4.

Records obtained from the Illinois State Water Survey (ISWS) indicate that there are numerous industrial/commercial (I/C) wells pumping groundwater from the alluvial/glacial outwash formation and the limestone/dolomite formation throughout the Hartford, Roxana, and Wood River area, including wells at Clark Oil. The industrial/commercial wells are drawing water from between twenty and one hundred seventy-one feet below ground surface. The shallow I/C wells are older wells drilled during the early 1900's, some of which are no longer in use. Drinking water in the area is supplied by public and private wells and through the distribution system of the Illinois American Water Company (IAWC). Public and private wells utilize the shallow sand and gravel alluvial and glacial outwash deposits of the American Bottoms for drinking water supplies. IAWC utilizes surface water from the Mississippi River as a source for drinking water. IAWC operates three intakes near the Clark Oil & Refining facility. One upstream at Alton, Ill. (river mile 202); and two downstream, one on Chouteau Island (river mile191.6) and another at East St. Louis (river mile 180.8). The Illinois State Water Survey (ISWS) records indicate that Hartford, Roxana, South Roxana, East Alton, Bethalto, Edwardsville, and Wood River are utilizing groundwater as a source of drinking water. Hartford uses two active and has two standby wells in serving 1680 residents, Roxana and South Roxana use three wells in serving 3560 residents, East Alton uses six wells in serving 7100 residents, Bethalto uses five wells in serving 9500 residents, Edwardsville uses nine wells, located in the community of Poag, in the American Bottoms in serving 20,250 residents and Southern Illinois University's Edwardsville Campus, and Wood River uses four wells in serving 11,900 residents. All of the wells are between seventy-nine and one hundred fifteen feet deep and extracting water from the sand and gravel aquifer. According to Illinois State Water Survey records, there are approximately 161 private wells (serving 423 people) within four miles of the Clark Oil & Refining facility using the alluvial/glacial outwash aquifer. Total population using the sand and gravel aquifer is 54,151. Within a four-mile radius of the Clark facility there are no private drinking water wells penetrating the shallow Pennsylvanian and Mississippian limestone and dolomite aquifer. Although this aquifer is hydraulically connected to the alluvial/glacial outwash sand and gravel aquifer, there are no known individuals within four-miles of the Clark facility directly utilizing the limestone/dolomite aquifer other than for I/C purposes. The closest private domestic well uses the sand and gravel aquifer of concern and is, according to ISWS well logs, 3500 feet north of the facility with a total depth of ninety-seven feet. Hartford's Well #4 is the closest public well to Clark, being 1600 feet west of the facility's refinery operations. This well, and well #3, has been documented to contain volatile organic and semi-volatile contaminants. In addition to the presence of contamination in the public wells, there have been documented incidents of petroleum odor in basements of a number of residences in the north portion of Hartford. Evacuation of these homes was required while the basements were ventilated. A number of recovery wells have been placed at various locations throughout Hartford to recover petroleum constituents from the surface of area groundwater. Information obtained monthly from recording devices attached to the extraction wells indicate volumes of petroleum constituents in the thousands of gallons recovered from a number of these wells.

A listing of the number of public and private wells and approximate number of users in each distance category are presented below.

**Number of wells and users within 4-miles of Clark Oil & Refining Company**

| Distance | Groundwater Wells | Private Well Population | Public Well Population |
|---|---|---|---|
| 0 - 1/4 mile | 0 | 0 | 1680 (Hartford) |
| 1/4 - 1/2 mile | 0 | 0 | 0 |
| 2 - 1 mile | 2 | 5 | 0 |
| 1 - 2 miles | 18 | 47 | 15,460 (Roxana & S. Roxana) |
| 2 - 3 miles | 57 | 150 | 9,500 (Bethalto) |
| 3 - 4 miles | 84 | 221 | 27,350 (E. Alton) (Edwardsville) |

The private well population was calculated using USGS topographic maps for the area surrounding the facility and 2.63 people per household in Madison County, as established by the U.S. Census Bureau (1990). Public well information obtained from the Illinois State Water Survey.

## 4.2 SURFACE WATER

As mentioned in Section 1.2, surface water runoff from the Clark Oil & Refining is collected in either area drains or open channels and routed to the Guard Basin at the southeast portion of the refinery facility. Also as mentioned in Section 1.2, skimmers remove any grease or oil from the water surface entering the Guard Basin. Water in the Guard Basin is used as the refinery's fire protection reservoir. Any drainage not collected by the area drains or channel tends to pool and evaporate. There is a limited amount of drainage, which flows off of the property and into roadside ditches east and south of the facility. Drainage patterns viewed on topographic maps and aerial photographs have been visually verified. Drainage that collects in the roadside ditches flows south and east via overland flow toward the intersection of State Route 111 and Hawthorne St. Drainage then flows south along the west side of Route 111 for two miles at which point it flows into the Cahokia Diversion Channel. The Diversion Channel then flows two and one half miles to the Mississippi River. The point at which the small ditches carrying surface runoff enters the Cahokia Diversion Channel is identified as the probable point of entry (PPE) to surface water for the drainage pattern from the site. The PPE is located four and one half miles from the southeast corner of the site. The 15-mile in-water segment of the surface water pathway begins at the confluence of the Route 111 roadside ditch and the Cahokia Diversion Channel and terminates at Mississippi River mile 182.5. The Illinois American Water Company (IAWC) utilizes surface water from the Mississippi River as a source of drinking water for communities in the Alton, Granite City, Cahokia area. IAWC operates three intakes near the Clark Oil & Refining facility . One upstream at Alton, Ill. (river mile 202); and two downstream, one on Chouteau Island (river mile191.6) and another at East St. Louis (river mile 180.8). Along the 15 - mile in-water segment there is one surface water intake. This intake is located on Chouteau Island. There are no other known intakes along the 15-mile in-water segment of surface water route. The Mississippi River in-water segment, from river mile 195 to river mile 182.5, has been identified as a fishery. Wetlands exist; approximately four thousand feet south of Clark, west of Route 111; along the Cahokia Diversion Channel, and along the Mississippi River. The wetland area south of Clark is described as a palustrian, emergent seasonally flooded environment. The open channel of the Diversion Channel is described as a riverine, lower perennial, unconsolidated bottom, permanently flooded, excavated environment. Along and outside of both banks of the channel is described as palustrian, emergent/scrub-shrub/forested, persistent or broad-leafed deciduous, temporarily or seasonally flooded environments. Along and beyond the banks of the Mississippi River are environments similar to those described for the Cahokia Diversion Channel.

No surface water or sediment samples were collected during the November 1, 2 & 9, 2000 Expanded Site Investigation of Clark Oil & Refining Company. The focus of this ESI centered on evaluating soil (shallow elevations and at depth) for contamination and its proximity to groundwater.

## 4.3 SOIL EXPOSURE PATHWAY

Soil sample analytical results indicate observed exposure to the soil exposure pathway by contaminants that are attributable to the sites' former activities and products and are within the top two feet of soil or cover material. Current analytical data compared with previously collected data indicate that qualitatively the site contamination remains the same. Compounds found three times background concentrations or above detection limits from this sampling effort are considered valid as a confirmed release to the soil exposure pathway (reference Tables 5 - 8). Contributing factors to this contamination have been discussed previously.

Activity on site consists of persons working in and around structures and plant process equipment. Activities on site (daily activity, demolition, construction, etc.) result in various degrees of surface disturbance. A number of spills and leaks etc. have occurred during the existence of the company. Remediation efforts were indicated to have been initiated with all mishaps. Clark Oil has always indicated that cleanup efforts were satisfactorily completed according to appropriate regulations. Clark Oil & Refining employs approximately 150 people. These workers have the potential to contact contaminated waste, soil and/or breathe contaminated air. The same could be said about those individuals (contractors) who have been or are now involved with previous or current site activities, such as demolition or construction. Contact potential may continue depending on future site activity. Analysis of samples collected during the November 2000 ESI indicate contaminants exist on Clark property from surface grade to a depth, below current grade, of up to 11 feet. Within a 4-mile radius of the site the population is calculated to be approximately 27,960 persons. The nearest individual is located in a residential dwelling approximately 300 feet west of the southwest corner of the Clark refinery property. Three persons reside in this dwelling.

There are no schools or day care facilities on-site or within 200 feet of contaminated areas. Nearby population within one mile of Clark has been calculated to be 4,646 and is presented below.

**Workers and Near-by population within one mile of the site**

| Distance | Population |
|---|---|
| On-site | 150 |
| 0 - 1/4 mile | 919 |
| 1/4 - 2 mile | 1,269 |
| 2 - 1 mile | 2,308 |

The population was calculated using USGS topographic maps for the area surrounding the facility and 2.63 people per household in Madison County, as established by the U.S. Census Bureau (1990)

## 4.4 AIR ROUTE

During the November 1, 2, & 9, 2000 Expanded Site Investigation there were no formal air samples collected. A Foxboro TVA was utilized to screen ambient air around the site, air in the breathing zone at each sample point, and the sample as it was taken. This unit was also used during operation of the Geoprobe to screen the breathing zone and sample cores as the core sleeves were opened prior to sampling.

Agency records indicate that Clark Oil & Refining has had a number of air releases and permit violations over the years of operation. With each incident mitigative measures were and have been implemented to correct problems and attempt to avoid future incidents. Air Permits issued to Clark have applied to their various process equipment and storage tanks.

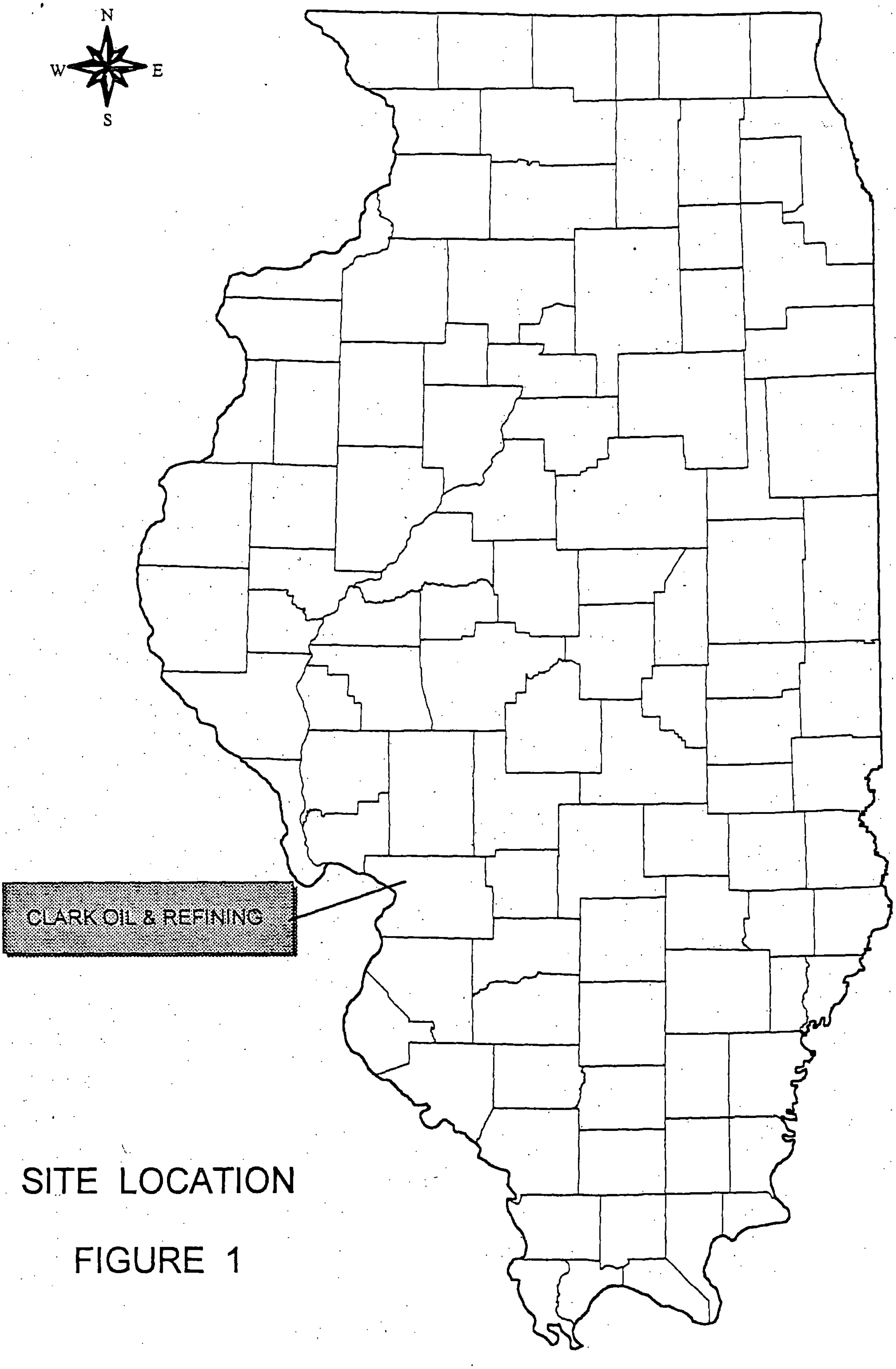
Within a 4-mile radius of the site the population is calculated to be approximately 27,960 persons. The nearest individual (Clark Oil & Refining employees) and regularly occupied building (the buildings on Clark Oil property) is located on-site, situated at various locations on the property. The approximate number of individuals potentially exposed to air-borne particulates is listed below. The potential for wind blown particulates to carry contaminants off-site is possible since these contaminants have been found in the top six inches of soil on-site. Sensitive environments within four miles of Clark Oil property consist of wetlands, which have been described previously in this report.

## Individuals potentially exposed to air-borne contaminants

| Distance | Population |
|---|---|
| On-site | 150 |
| 0 - 1/4 mile | 919 |
| 1/4 - 1/2 mile | 1269 |
| 1/2 - 1 mile | 2308 |
| 1 - 2 miles | 7046 |
| 2 - 3 miles | 8758 |
| 3 - 4 miles | 7510 |

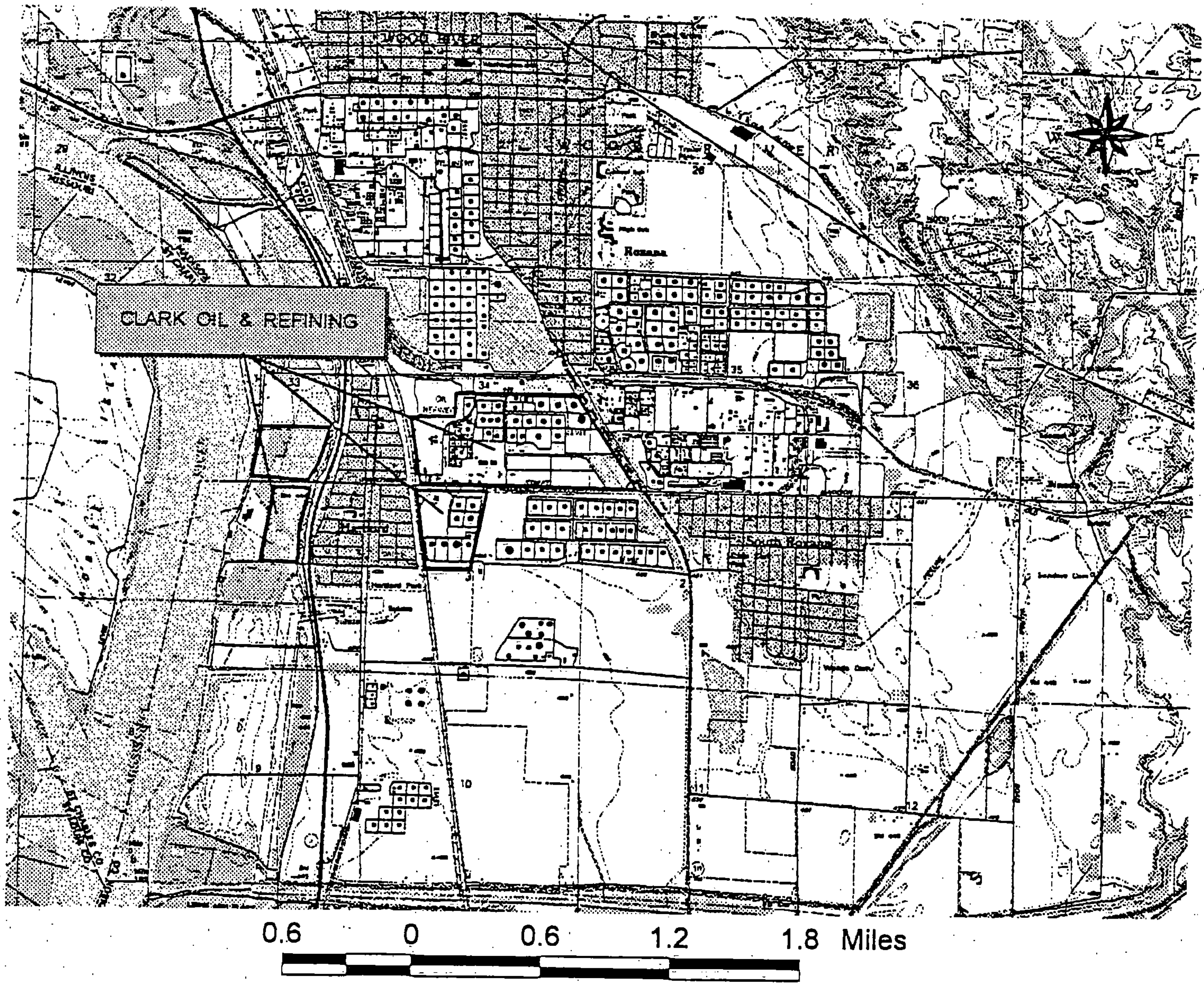
The population was calculated using USGS topographic maps for the area surrounding the facility and 2.63 people per household in Madison County, as established by the U.S. Census Bureau (1990)

# 5.0 FIGURES AND TABLES



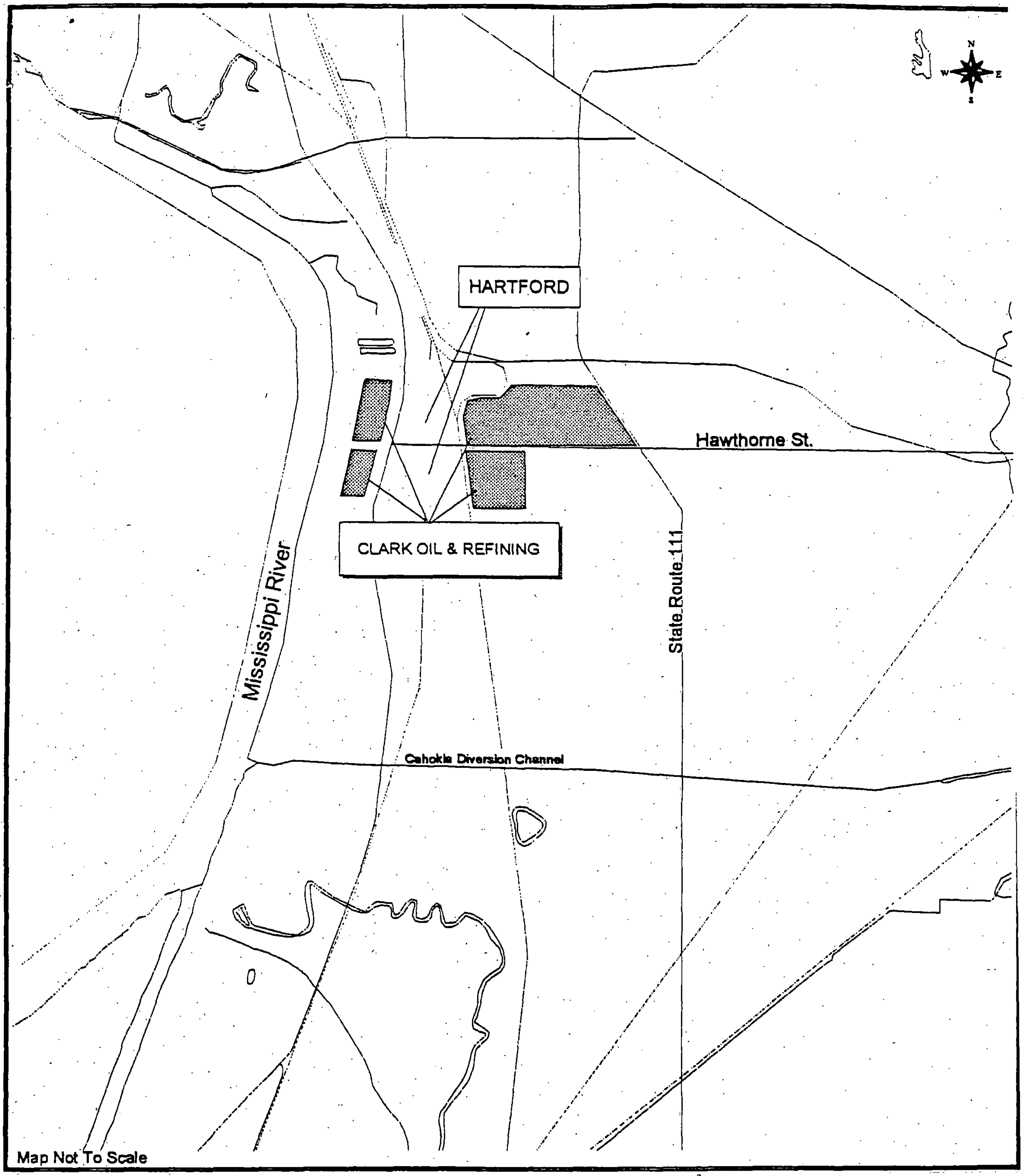

SITE LOCATION

FIGURE 1




TOPOGRAPHIC MAP

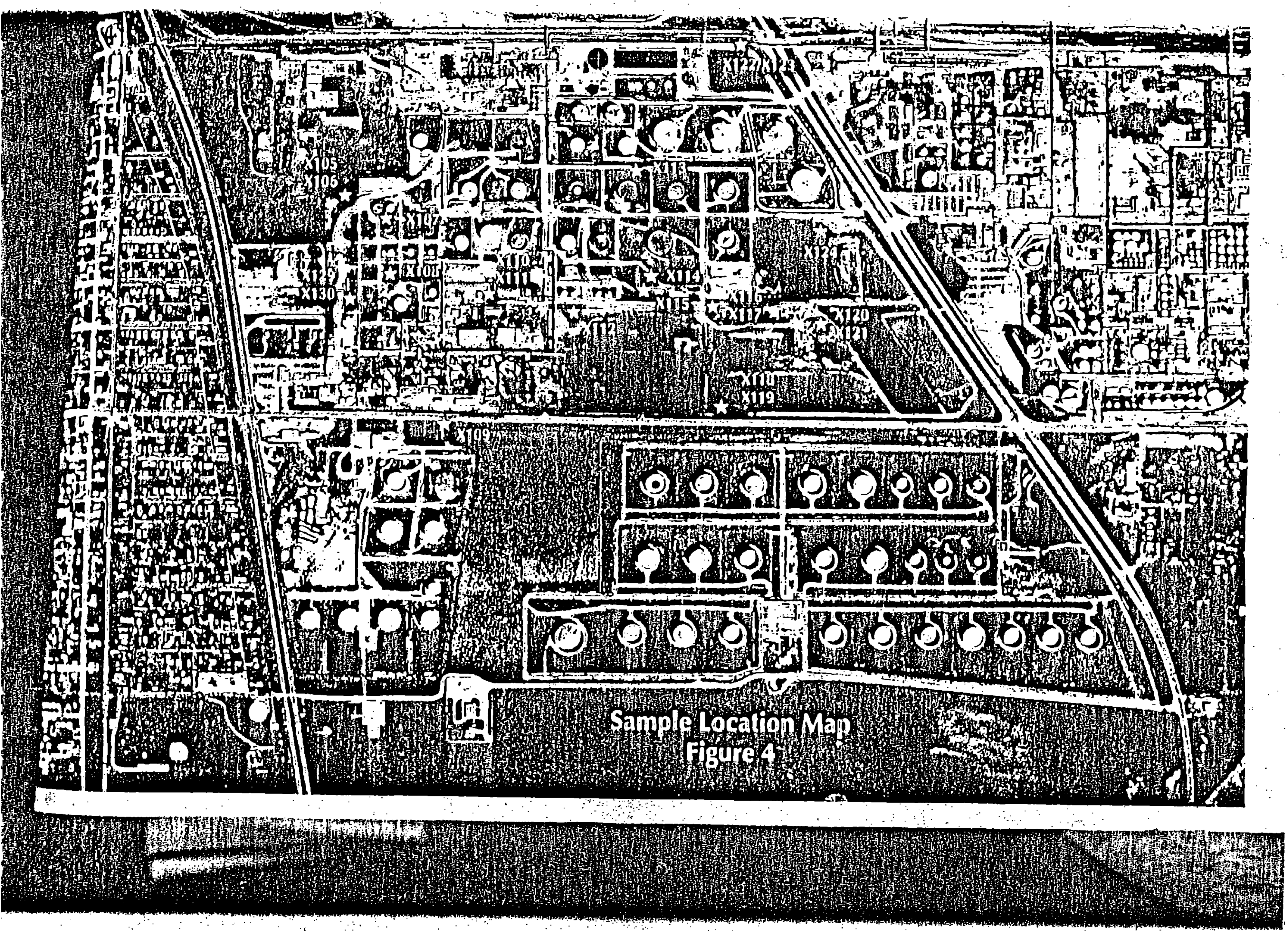
Figure 2



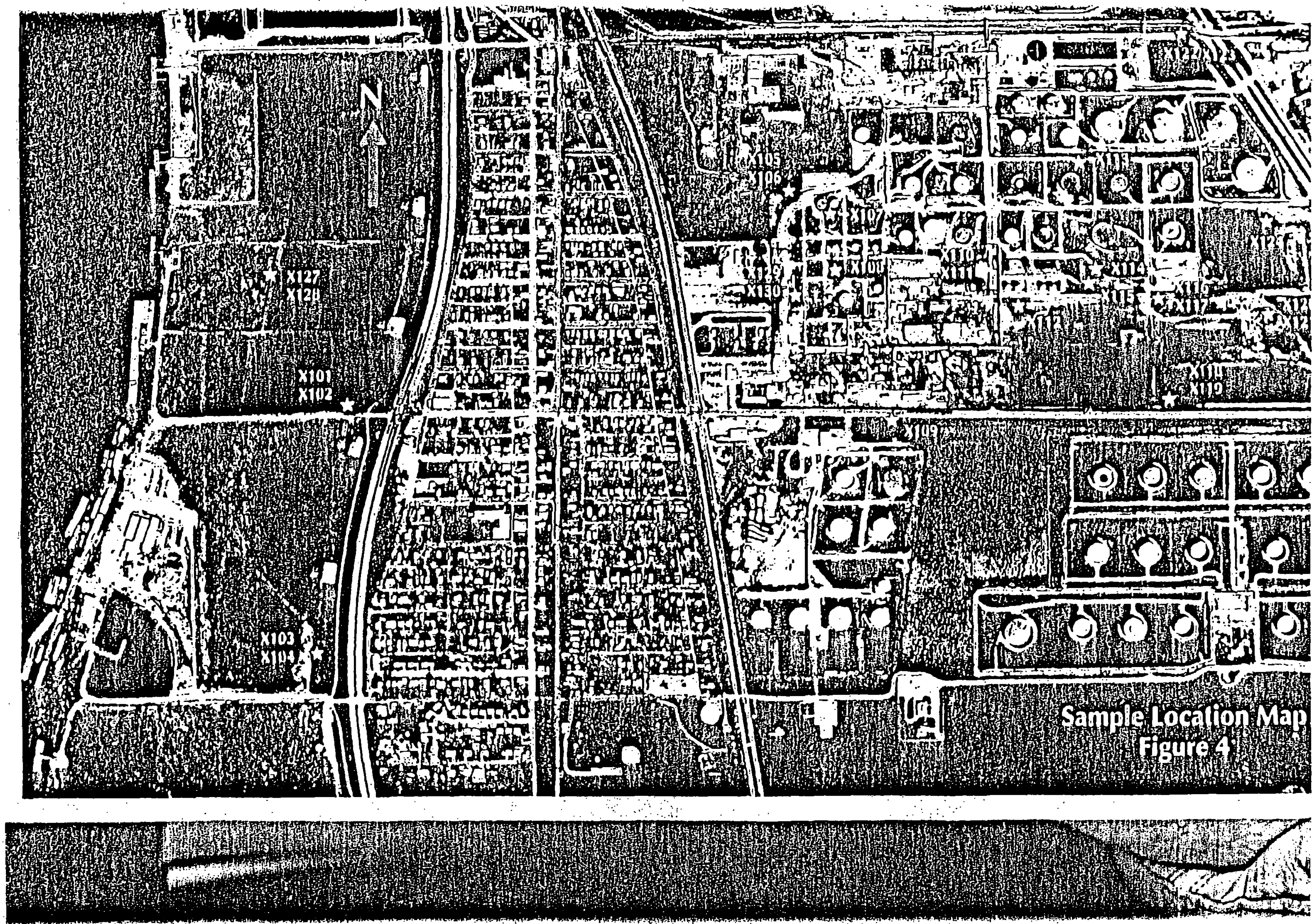

CLARK OIL & REFINING

Local Features Map

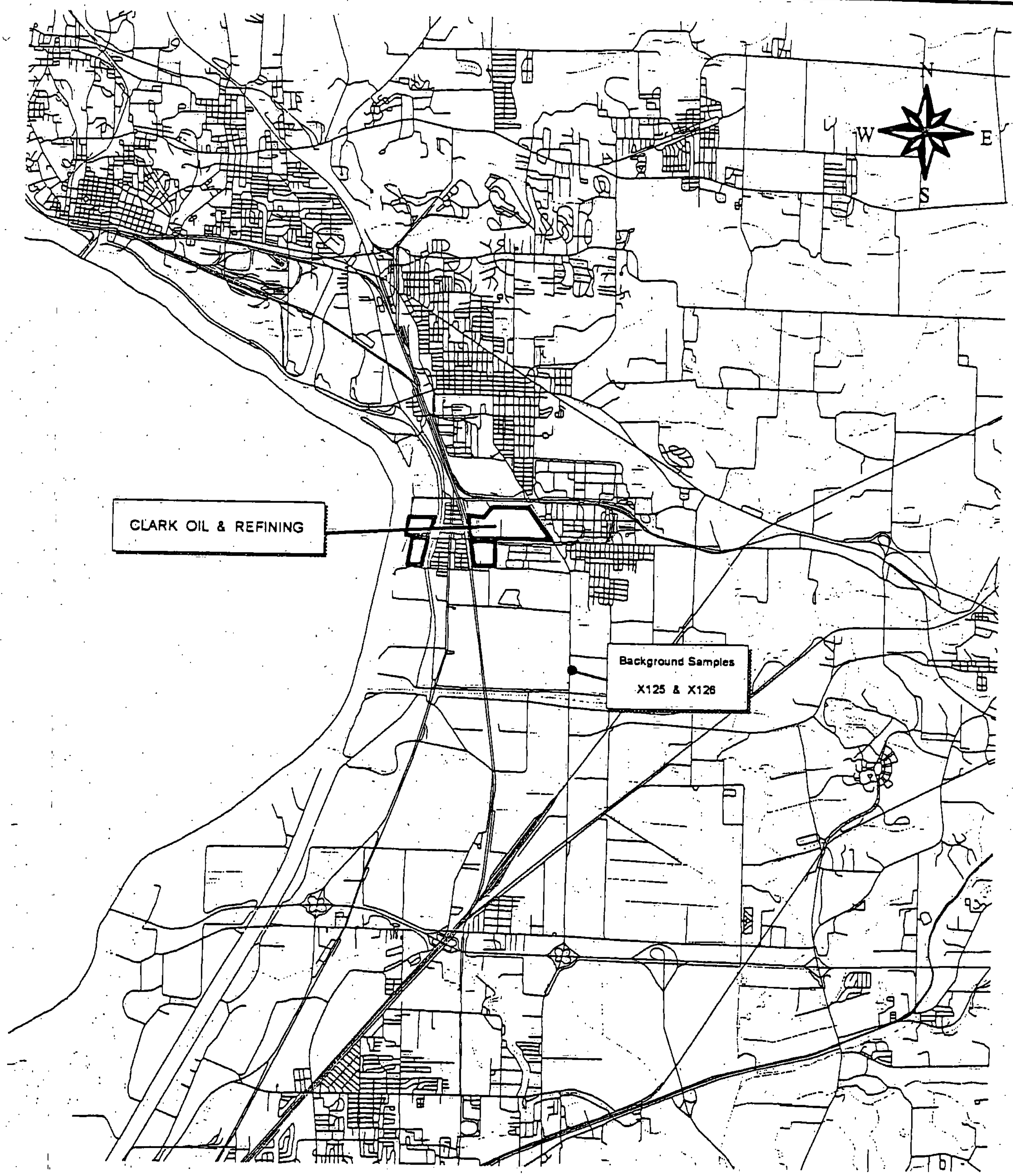
Figure 3




Sample Location Map
Figure 4




Sample Location Map
Figure 4




OFF - SITE
SAMPLE LOCATION MAP

Figure 5

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

TABLE 1

| Analytical Results (Qualified Data) | | Page 1 |
|---|---|---|
| Case #: 28678 | SDG : EE01B | |
| Site : | CLARK OIL | |
| Lab. : | LIBRTY | |
| Reviewer : | | |
| Date : | | |

| Sample Number : | EE01B | | EE01C | | EE01D | | EE01E | | EE01F | | EE01G | | EE01H | | EE01J | | EE01K | | EE01L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X101 | | X102 | | X103 | | X104 | | X105 | | X106 | | X107 | | X108 | | X109 | | X110 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 11:30 | | 11:30 | | 12:50 | | 13:10 | | 15:00 | | 15:20 | | 16:00 | | 16:45 | | 08:15 | | 09:25 | |
| %Moisture : | 0 | | 29 | | 16 | | 22 | | 8 | | 21 | | 18 | | 25 | | 20 | | 20 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Volatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| Dichlorodifluoromethane | 19 | U | 14 | UJ | 11 | U | 11 | UJ | 10 | UJ | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Chloromethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Vinyl Chloride | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Bromomethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 160 | J | 22 | U | 12 | U | 11 | U |
| Chloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Trichlorofluoromethane | 19 | U | 14 | UJ | 11 | U | 11 | UJ | 1 | J | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| 1,1-Dichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Acetone | 110 | J | 36 | UJ | 50 | J | 11 | U | 200 | J | 1100 | U | 1100 | U | 200 | J | 11 | J | 19 | UJ |
| Carbon Disulfide | 19 | U | 2 | J | 11 | U | 11 | UJ | 2 | J | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Methyl Acetate | 8 | J | 14 | UJ | 11 | UJ | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | UJ | 6 | J | 11 | UJ |
| Methylene Chloride | 19 | U | 14 | U | 11 | U | 11 | U | 16 | U | 1100 | U | 140 | J | 22 | U | 16 | | 11 | U |
| trans-1,2-Dichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Methyl tert-Butyl Ether | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,1-Dichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| cis-1,2-Dichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 2-Butanone | 23 | J | 6 | J | 9 | J | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | UJ | 12 | UJ | 11 | U |
| Chloroform | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 1 | J |
| 1,1,1-Trichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Cyclohexane | 4 | J | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 1 | J |
| Carbon Tetrachloride | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Benzene | 19 | U | 14 | U | 11 | U | 2 | J | 10 | U | 200 | J | 1400 | J | 6 | J | 12 | U | 2 | J |
| 1,2-Dichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Trichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Methylcyclohexane | 4 | J | 14 | U | 11 | U | 4 | J | 10 | U | 9100 | | 2800 | J | 180 | | 12 | U | 3 | J |
| 1,2-Dichloropropane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Bromodichloromethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| cis-1,3-Dichloropropene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 4-Methyl-2-pentanone | 12 | J | 14 | UJ | 11 | U | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Toluene | 19 | U | 4 | J | 2 | J | 3 | J | 9 | J | 1100 | U | 810 | J | 22 | U | 2 | J | 3 | J |
| trans-1,3-Dichloropropene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,1,2-Trichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Tetrachloroethene | 19 | U | 1 | J | 11 | U | 2 | J | 2 | J | 1100 | U | 1100 | U | 22 | U | 2 | J | 11 | U |
| 2-Hexanone | 19 | U | 14 | UJ | 11 | U | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Dibromochloromethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2-Dibromoethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Chlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Ethylbenzene | 19 | U | 14 | U | 11 | U | 11 | U | 5 | J | 1400 | | 5300 | J | 22 | U | 12 | U | 11 | U |
| Xylenes (total) | 19 | U | 42 | | 11 | U | 11 | U | 10 | | 180 | J | 35000 | J | 220 | | 12 | U | 5 | J |
| Styrene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 150 | J | 22 | U | 12 | U | 11 | U |
| Bromoform | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Isopropylbenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | | 420 | J | 400 | J | 13 | J | 12 | U | 11 | U |
| 1,1,2,2-Tetrachloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,3-Dichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,4-Dichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2-Dichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2-Dibromo-3-chloropropane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2,4-Trichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |

# CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

TABLE 1

Analytical Results (Qualified Data)



Case #: 28678 SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture : | 16 | | 29 | | 29 | | 4 | | 26 | | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Volatile Compound** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| Dichlorodifluoromethane | 12 | U | 70 | U | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Vinyl Chloride | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromomethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Trichlorofluoromethane | 12 | U | 70 | U | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Acetone | 43 | J | 70 | UJ | 23 | J | 8000 | UJ | 34 | UJ | 49 | J | 52 | J | 20 | UJ | 210 | J | 130 | J |
| Carbon Disulfide | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methyl Acetate | 12 | UJ | 70 | UJ | 14 | UJ | 8000 | U | 13 | UJ | 14 | UJ | 14 | UJ | 20 | UJ | 64 | UJ | 9 | UJ |
| Methylene Chloride | 17 | | 70 | U | 22 | | 8000 | U | 14 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| trans-1,2-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methyl tert-Butyl Ether | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1-Dichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| cis-1,2-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 2-Butanone | 23 | J | 70 | U | 5 | J | 8000 | UJ | 6 | J | 9 | J | 14 | U | 20 | U | 33 | J | 22 | |
| Chloroform | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,1-Trichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Cyclohexane | 12 | U | 200 | | 14 | U | 58000 | | 1 | J | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Carbon Tetrachloride | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Benzene | 12 | U | 70 | U | 14 | U | 7100 | J | 3 | J | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Trichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methylcyclohexane | 1 | J | 710 | | 14 | U | 130000 | | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 1 | J |
| 1,2-Dichloropropane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromodichloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| cis-1,3-Dichloropropene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 4-Methyl-2-pentanone | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Toluene | 2 | J | 16 | J | 3 | J | 1800 | J | 2 | J | 2 | J | 14 | U | 20 | U | 64 | U | 2 | J |
| trans-1,3-Dichloropropene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2-Trichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Tetrachloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 1 | J | 3 | J | 64 | U | 9 | U |
| 2-Hexanone | 12 | U | 70 | UJ | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | UJ | 20 | UJ | 64 | UJ | 9 | UJ |
| Dibromochloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dibromoethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Ethylbenzene | 12 | U | 30 | J | 14 | U | 10000 | | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Xylenes (total) | 12 | U | 1000 | | 14 | U | 34000 | | 2 | J | 14 | U | 14 | U | 20 | U | 64 | U | 4 | J |
| Styrene | 12 | U | 20 | J | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromoform | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Isopropylbenzene | 12 | U | 39 | J | 14 | U | 2900 | J | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2,2-Tetrachloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,3-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,4-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dibromo-3-chloropropane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2,4-Trichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |

CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

TABLE 1

Analytical Results (Qualified Data) | Page 3

Case #: 28678 | SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | | 21 | | 24 | | 39 | | 26 | | 26 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Volatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| Dichlorodifluoromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Vinyl Chloride | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromomethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Trichlorofluoromethane | 12 | U | 13 | U | 12 | U | 10 | U | 1 | J | 14 | UJ | 11 | UJ | 16 | UJ | 2 | J | 16000 | U |
| 1,1-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Acetone | 23 | J | 17 | J | 21 | J | 24 | J | 49 | J | 14 | UJ | 160 | J | 29 | UJ | 49 | J | 24000 | |
| Carbon Disulfide | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 2 | J | 16 | UJ | 4 | J | 16000 | U |
| Methyl Acetate | 12 | UJ | 13 | UJ | 12 | UJ | 10 | UJ | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Methylene Chloride | 15 | | 13 | U | 16 | | 10 | U | 11 | U | 24 | U | 18 | U | 17 | U | 17 | U | 4100 | J |
| trans-1,2-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Methyl tert-Butyl Ether | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1-Dichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| cis-1,2-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 2-Butanone | 12 | UJ | 13 | UJ | 4 | J | 10 | UJ | 4 | J | 14 | UJ | 23 | J | 16 | UJ | 12 | UJ | 16000 | U |
| Chloroform | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,1-Trichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Cyclohexane | 12 | U | 13 | U | 12 | U | 2 | J | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Carbon Tetrachloride | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Benzene | 12 | U | 13 | U | 12 | U | 1 | J | 11 | U | 14 | U | 11 | U | 16 | U | 53 | | 34000 | J |
| 1,2-Dichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Trichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Methylcyclohexane | 12 | U | 13 | U | 12 | U | 3 | J | 11 | U | 14 | U | 11 | U | 16 | U | 120 | | 89000 | |
| 1,2-Dichloropropane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromodichloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| cis-1,3-Dichloropropene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 4-Methyl-2-pentanone | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 11 | UJ | 18 | UJ | 12 | UJ | 16000 | U |
| Toluene | 1 | J | 13 | U | 2 | J | 4 | J | 11 | U | 2 | J | 3 | J | 16 | U | 4 | J | 16000 | U |
| trans-1,3-Dichloropropene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,2-Trichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Tetrachloroethene | 2 | J | 2 | J | 12 | U | 1 | J | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 2-Hexanone | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Dibromochloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dibromoethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Ethylbenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 3 | J | 110000 | |
| Xylenes (total) | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 4 | J | 11 | U | 16 | U | 8 | J | 160000 | |
| Styrene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromoform | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Isopropylbenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 18 | | 17000 | |
| 1,1,2,2-Tetrachloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,3-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,4-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dibromo-3-chloropropane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | UJ |
| 1,2,4-Trichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |

CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

TABLE 2

| | |
|---|---|
| Analytical Results (Qualified Data) | Page 1 |
| Case #: 28578 | SDG : EE01B |
| Site : | CLARK OIL |
| Lab : | LIBRTY |
| Reviewer : | |
| Date | |

| Sample Number : | EE01B | | EE01C | | EE01D | | EE01E | | EE01F | | EE01G | | EE01H | | EE01J | | EE01K | | EE01L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location | X101 | | X102 | | X103 | | X104 | | X105 | | X106 | | X107 | | X108 | | X109 | | X110 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled | 11:30 | | 11:30 | | 12:50 | | 13:10 | | 15:00 | | 15:20 | | 16:00 | | 16:45 | | 08:15 | | 09:25 | |
| %Moisture : | 0 | | 29 | | 16 | | 21 | | 8 | | 21 | | 18 | | 25 | | 20 | | 20 | |
| pH | 0.0 | | 7.7 | | 7.7 | | 8.0 | | 6.6 | | 7.9 | | 7.7 | | 8.4 | | 5.8 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 1.0 | | 1.0 | |
| Semivolatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | F |
| Benzaldehyde | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Phenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| bis-(2-Chloroethyl) ether | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2-Chlorophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2-Methylphenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2,2'-oxybis(1-Chloropropane) | 9000 | UJ | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Acetophenone | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 4-Methylphenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| N-Nitroso-di-n-propylamine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Hexachloroethane | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Nitrobenzene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 | U |
| Isophorone | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2-Nitrophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2,4-Dimethylphenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| bis(2-Chloroethoxy)methane | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2,4-Dichlorophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Naphthalene | 9000 | U | 460 | U | 390 | U | 420 | U | 250 | J | 150 | J | 2500 | | 440 | U | 410 | U | 410 | U |
| 4-Chloroaniline | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Hexachlorobutadiene | 9000 | UJ | 460 | UJ | 390 | UJ | 420 | UJ | 360 | UJ | 420 | UJ | 800 | UJ | 440 | UJ | 410 | U | 410 | U |
| Caprolactam | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 4-Chloro-3-methylphenol | 9000 | U | 460 | UJ | 390 | UJ | 420 | UJ | 360 | UJ | 420 | UJ | 800 | U | 440 | UJ | 410 | U | 410 | U |
| 2-Methylnaphthalene | 9000 | U | 460 | U | 110 | J | 420 | U | 890 | | 1100 | | 2000 | | 440 | U | 410 | U | 73 | J |
| Hexachlorocyclopentadiene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 | U |
| 2,4,6-Trichlorophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2,4,5-Trichlorophenol | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 | U |
| 1,1'-Biphenyl | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 110 | J | 440 | U | 410 | U | 410 | U |
| 2-Chloronaphthalene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2-Nitroaniline | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 | U |
| Dimethylphthalate | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 2,6-Dinitrotoluene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Acenaphthylene | 9000 | U | 460 | U | 390 | U | 420 | U | 380 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 3-Nitroaniline | 23000 | UJ | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 | U |
| Acenaphthene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 50 | J | 410 | U | 200 | J |
| 2,4-Dinitrophenol | 23000 | U | 1200 | UJ | 990 | UJ | 1100 | UJ | 900 | UJ | 1100 | UJ | 2000 | U | 1100 | UJ | 1000 | U | 1000 | U |
| 4-Nitrophenol | 23000 | UJ | 1200 | UJ | 990 | UJ | 1100 | UJ | 900 | UJ | 1100 | UJ | 2000 | UJ | 1100 | UJ | 1000 | U | 1000 | U |
| Dibenzofuran | 9000 | U | 460 | U | 42 | J | 420 | U | 360 | U | 420 | U | 800 | U | 47 | J | 410 | U | 410 | U |
| 2,4-Dinitrotoluene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Diethylphthalate | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Fluorene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 66 | J | 410 | U | 100 | J |
| 4-Chlorophenyl-phenyl ether | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 | U |
| 4-Nitroaniline | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 | UJ |
| 4,6-Dinitro-2-methylphenol | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 | U |
| N-Nitrosodiphenylamine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 4-Bromophenyl-phenylether | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Hexachlorobenzene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Atrazine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Pentachlorophenol | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 | U |
| Phenanthrene | 9000 | U | 460 | U | 250 | J | 420 | U | 360 | U | 420 | U | 180 | J | 69 | J | 410 | U | 280 | J |
| Anthracene | 9000 | U | 460 | U | 50 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 200 | J |
| Carbazole | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | UJ |
| Di-n-butylphthalate | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Fluoranthene | 9000 | U | 460 | UJ | 260 | J | 420 | UJ | 360 | UJ | 420 | UJ | 800 | U | 440 | UJ | 410 | U | 410 | U |
| Pyrene | 9000 | U | 200 | J | 350 | J | 420 | U | 360 | U | 420 | U | 370 | J | 48 | J | 410 | U | 2000 | |
| Butylbenzylphthalate | 9000 | UJ | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| 3,3'-Dichlorobenzidine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 | U |
| Benzo(a)anthracene | 9000 | U | 460 | U | 130 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | J |
| Chrysene | 9000 | U | 96 | J | 160 | J | 420 | U | 360 | U | 420 | U | 120 | J | 440 | U | 410 | U | 920 | |
| bis(2-Ethylhexyl)phthalate | 9000 | U | 220 | J | 52 | J | 420 | U | 850 | | 600 | | 800 | U | 460 | | 410 | U | 3500 | |
| Di-n-octylphthalate | 9000 | U | 1000 | | 390 | U | 120 | J | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Benzo(b)fluoranthene | 9000 | U | 460 | U | 240 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 180 | J |
| Benzo(k)fluoranthene | 9000 | U | 460 | U | 190 | J | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 150 | J |
| Benzo(a)pyrene | 9000 | U | 460 | U | 130 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 330 | J |
| Indeno(1,2,3-cd)pyrene | 9000 | U | 460 | U | 91 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 55 | J |
| Dibenzo(a,h)anthracene | 9000 | U | 460 | U | 45 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 | U |
| Benzo(g,h,i)perylene | 9000 | U | 460 | U | 100 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 170 | J |

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

TABLE 2

Analytical Results (Qualified Data)



Case #: 28678
Site
Lab
Reviewer:
Date:

SDG : EE01K
CLARK OIL
LIBRTY

| Sample Number | EE01M | EE01N | EE01P | EE01Q | EE01R | EE01S | EE01T | EE01W | EE01X | EE01Y |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location: | X111 | X112 | X113 | X114 | X115 | X116 | X117 | X118 | X119 | X120 |
| Matrix: | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil | Soil |
| Units | ug/Kg | ug/Kg | ug/Kg | ug/Kg | ug/Kg | ug/Kg | ug/Kg | ug/Kg | ug/Kg | ug/Kg |
| Date Sampled | 11/02/2000 | 11/02/2000 | 11/02/2000 | 11/02/2000 | 11/02/2000 | 11/02/2000 | 11/02/2000 | 11/02/2000 | 11/02/2000 | 11/02/2000 |
| Time Sampled | 09:35 | 10:05 | 11:05 | 12:00 | 12:15 | 13:25 | 13:25 | 14:20 | 14:35 | 15:40 |
| %Moisture | 16 | 29 | 29 | 4 | 26 | 18 | 19 | 18 | 22 | 4 |
| pH: | 7.9 | 7.9 | 7.6 | 7.4 | 7.1 | 7.6 | 6.9 | 8.0 | 8.4 | 8.3 |
| Dilution Factor | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 2.0 | 1.0 | 1.0 | 1.0 |

| Semivolatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Benzaldehyde | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Phenol | 390 | U | 80000 | J | 460 | U | 31000 | U | 450 | U | 2000 | | 450 | J | 130000 | | 420 | U | 84 |
| bis-(2-Chloroethyl) ether | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2-Chlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2-Methylphenol | 390 | U | 2300 | J | 460 | U | 31000 | U | 450 | U | 800 | | 250 | J | 4100 | J | 420 | U | 52 |
| 2,2'-oxybis(1-Chloropropane) | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Acetophenone | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 4-Methylphenol | 390 | U | 30000 | | 460 | U | 31000 | U | 450 | U | 1600 | | 460 | J | 51000 | | 46 | J | 120 |
| N-Nitroso-di-n-propylamine | 390 | U | 14000 | UJ | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Hexachloroethane | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Nitrobenzene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Isophorone | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2-Nitrophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2,4-Dimethylphenol | 390 | U | 2900 | J | 460 | U | 31000 | U | 450 | U | 380 | J | 130 | J | 12000 | U | 420 | U | 340 |
| bis(2-Chloroethoxy)methane | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2,4-Dichlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Naphthalene | 390 | U | 21000 | | 460 | U | 31000 | U | 450 | U | 2200 | | 960 | | 19000 | | 420 | U | 450 |
| 4-Chloroaniline | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Hexachlorobutadiene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Caprolactam | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 4-Chloro-3-methylphenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2-Methylnaphthalene | 390 | U | 94000 | | 460 | U | 7000 | J | 50 | J | 10000 | | 2800 | | 100000 | | 89 | J | 1900 |
| Hexachlorocyclopentadiene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | UJ | 12000 | U | 420 | U | 340 |
| 2,4,6-Trichlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2,4,5-Trichlorophenol | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 |
| 1,1'-Biphenyl | 390 | U | 5500 | J | 460 | U | 31000 | U | 450 | U | 200 | J | 110 | J | 5100 | J | 420 | U | 340 |
| 2-Chloronaphthalene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 |
| Dimethylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 2,6-Dinitrotoluene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Acenaphthylene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 3-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 |
| Acenaphthene | 390 | U | 6500 | J | 460 | U | 31000 | U | 450 | U | 140 | J | 810 | U | 10000 | J | 420 | U | 120 |
| 2,4-Dinitrophenol | 990 | U | 35000 | U | 1200 | U | 78000 | UJ | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 |
| 4-Nitrophenol | 990 | U | 35000 | U | 1200 | U | 78000 | UJ | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 |
| Dibenzofuran | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 420 | | 120 | J | 12000 | U | 420 | U | 340 |
| 2,4-Dinitrotoluene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Diethylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Fluorene | 390 | U | 10000 | J | 460 | U | 5500 | J | 450 | U | 280 | J | 85 | J | 22000 | | 83 | J | 420 |
| 4-Chlorophenyl-phenyl ether | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 4-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | UJ | 1000 | U | 2000 | U | 30000 | U | 1100 | UJ | 860 |
| 4,6-Dinitro-2-methylphenol | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 |
| N-Nitrosodiphenylamine | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 4-Bromophenyl-phenylether | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Hexachlorobenzene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Atrazine | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Pentachlorophenol | 990 | U | 35000 | R | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 |
| Phenanthrene | 390 | U | 24000 | | 460 | U | 29000 | J | 450 | U | 780 | | 300 | J | 35000 | | 190 | J | 1200 |
| Anthracene | 390 | U | 5300 | J | 460 | U | 31000 | U | 450 | U | 210 | J | 110 | J | 9300 | J | 420 | U | 110 |
| Carbazole | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | UJ | 75 | J | 810 | U | 4000 | J | 420 | UJ | 340 |
| Di-n-butylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Fluoranthene | 390 | U | 3200 | J | 460 | U | 31000 | U | 450 | U | 78 | J | 810 | U | 2100 | J | 220 | J | 160 |
| Pyrene | 390 | U | 13000 | J | 460 | U | 150000 | | 450 | U | 300 | J | 200 | J | 8000 | J | 990 | | 1100 |
| Butylbenzylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| 3,3'-Dichlorobenzidine | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Benzo(a)anthracene | 390 | U | 7000 | J | 460 | U | 60000 | | 450 | U | 260 | J | 160 | J | 6300 | J | 310 | J | 340 |
| Chrysene | 390 | U | 9800 | J | 460 | U | 120000 | | 450 | U | 400 | | 280 | J | 7300 | J | 550 | | 760 |
| bis(2-Ethylhexyl)phthalate | 390 | U | 11000 | J | 460 | U | 31000 | U | 450 | U | 74 | J | 810 | U | 12000 | U | 10000 | | 160 |
| Di-n-octylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 |
| Benzo(b)fluoranthene | 390 | U | 2800 | J | 460 | U | 16000 | J | 450 | U | 240 | J | 130 | J | 2900 | J | 110 | J | 230 |
| Benzo(k)fluoranthene | 390 | U | 2900 | J | 460 | U | 31000 | UJ | 450 | U | 220 | J | 140 | J | 3100 | J | 97 | J | 210 |
| Benzo(a)pyrene | 390 | U | 5700 | J | 460 | U | 31000 | | 450 | U | 330 | J | 190 | J | 6600 | J | 120 | J | 330 |
| Indeno(1,2,3-cd)pyrene | 390 | U | 2000 | J | 460 | U | 7500 | J | 450 | U | 140 | J | 87 | J | 2400 | J | 420 | U | 100 |
| Dibenzo(a,h)anthracene | 390 | U | 3000 | J | 460 | U | 8400 | J | 450 | U | 180 | J | 110 | J | 4100 | J | 51 | J | 91 |
| Benzo(g,h,i)perylene | 390 | U | 3100 | J | 460 | U | 18000 | J | 450 | U | 640 | | 380 | J | 3800 | J | 52 | J | 220 |

## CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

TABLE 2

Analytical Results (Qualified Data)



Case #: 28678
Site :
Lab. :
Reviewer :
Date :

SDG : EE01K
CLARK OIL
LIBRTY

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | | 21 | | 24 | | 39 | | 26 | | 26 |
| pH : | 7.0 | | 7.7 | | 7.5 | | 7.9 | | 6.5 | | 7.2 | | 7.7 | | 8.0 | | 8.5 | | 8.5 |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 |
| Semivolatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result |
| Benzaldehyde | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Phenol | 450 | U | 440 | U | 350 | U | 100 | J | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| bis-(2-Chloroethyl) ether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2-Chlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2-Methylphenol | 450 | U | 440 | U | 350 | U | 58 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2,2'-oxybis(1-Chloropropane) | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Acetophenone | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 4-Methylphenol | 450 | U | 440 | U | 350 | U | 110 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| N-Nitroso-di-n-propylamine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Hexachloroethane | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Nitrobenzene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Isophorone | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2-Nitrophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2,4-Dimethylphenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| bis(2-Chloroethoxy)methane | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2,4-Dichlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Naphthalene | 450 | U | 440 | U | 350 | U | 180 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 660 |
| 4-Chloroaniline | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Hexachlorobutadiene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Caprolactam | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 4-Chloro-3-methylphenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2-Methylnaphthalene | 450 | U | 440 | U | 350 | U | 650 | | 420 | U | 420 | U | 430 | U | 540 | U | 220 | J | 5100 |
| Hexachlorocyclopentadiene | 450 | UJ | 440 | U | 350 | UJ | 390 | UJ | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2,4,6-Trichlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2,4,5-Trichlorophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 |
| 1,1'-Biphenyl | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 86 |
| 2-Chloronaphthalene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2-Nitroaniline | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 |
| Dimethylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 2,6-Dinitrotoluene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Acenaphthylene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 3-Nitroaniline | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 |
| Acenaphthene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 120 |
| 2,4-Dinitrophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | UJ | 1100 | UJ | 1100 |
| 4-Nitrophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | UJ | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 |
| Dibenzofuran | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 140 |
| 2,4-Dinitrotoluene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Diethylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Fluorene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 270 |
| 4-Chlorophenyl-phenyl ether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 4-Nitroaniline | 1100 | U | 1100 | UJ | 880 | U | 980 | U | 1100 | U | 1100 | UJ | 1100 | UJ | 1400 | UJ | 1100 | UJ | 1100 |
| 4,6-Dinitro-2-methylphenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 |
| N-Nitrosodiphenylamine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 4-Bromophenyl-phenylether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Hexachlorobenzene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Atrazine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Pentachlorophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | UJ | 1100 | UJ | 1100 | UJ | 1400 | U | 1100 | U | 1100 |
| Phenanthrene | 450 | U | 440 | U | 350 | U | 160 | J | 420 | U | 420 | U | 430 | U | 540 | U | 140 | J | 770 |
| Anthracene | 450 | U | 440 | U | 350 | U | 70 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 66 |
| Carbazole | 450 | U | 440 | UJ | 350 | U | 43 | J | 420 | U | 420 | UJ | 430 | UJ | 540 | UJ | 450 | UJ | 450 |
| Di-n-butylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Fluoranthene | 450 | U | 440 | U | 350 | U | 220 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Pyrene | 450 | U | 110 | J | 350 | U | 230 | J | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 74 |
| Butylbenzylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| 3,3'-Dichlorobenzidine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | UJ | 430 | UJ | 540 | U | 450 | U | 450 |
| Benzo(a)anthracene | 450 | U | 440 | U | 350 | U | 160 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Chrysene | 450 | U | 74 | J | 350 | U | 190 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| bis(2-Ethylhexyl)phthalate | 450 | U | 45 | J | 73 | J | 69 | J | 420 | U | 420 | U | 430 | U | 60 | J | 450 | U | 450 |
| Di-n-octylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Benzo(b)fluoranthene | 450 | U | 440 | U | 350 | U | 130 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Benzo(k)fluoranthene | 450 | U | 440 | U | 350 | U | 120 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Benzo(a)pyrene | 450 | U | 440 | U | 350 | U | 100 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Indeno(1,2,3-cd)pyrene | 450 | U | 440 | U | 350 | U | 86 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Dibenzo(a,h)anthracene | 450 | U | 440 | U | 350 | U | 56 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |
| Benzo(g,h,i)perylene | 450 | U | 440 | U | 350 | U | 190 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 |

CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

TABLE 3

Analytical Results (Qualified Data)



| | |
|---|---|
| Case #: 28678 | SDG : EE01B |
| Site : | CLARK OIL |
| Lab. : | LIBRTY |
| Reviewer : | |
| Date : | |

| Sample Number : | EE01B | | EE01C | | EE01D | | EE01E | | EE01F | | EE01G | | EE01H | | EE01J | | EE01K | | EE01L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X101 | | X102 | | X103 | | X104 | | X105 | | X106 | | X107 | | X108 | | X109 | | X110 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 11:30 | | 11:30 | | 12:50 | | 13:10 | | 15:00 | | 15:20 | | 16:00 | | 16:45 | | 08:15 | | 09:25 | |
| %Moisture : | 0 | | 29 | | 16 | | 21 | | 8 | | 21 | | 18 | | 25 | | 20 | | 20 | |
| pH : | 0.0 | | 7.7 | | 7.7 | | 8.0 | | 6.6 | | 7.9 | | 7.7 | | 8.4 | | 5.8 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 5.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Pesticide/PCB Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| alpha-BHC | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 0.61 | J | 2.1 | U | 2.1 | U |
| beta-BHC | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 1.4 | J | 2.3 | U | 2.1 | U | 2.1 | U |
| delta-BHC | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 2.1 | U |
| gamma-BHC (Lindane) | 51 | U | 0.75 | J | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 0.23 | J | 2.3 | U | 2.1 | U | 1.9 | J |
| Heptachlor | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 2.1 | U |
| Aldrin | 51 | U | 2.4 | U | 18 | | 2.2 | U | 1.9 | U | 2.2 | U | 0.47 | J | 0.88 | J | 2.1 | U | 0.82 | J |
| Heptachlor epoxide | 4.3 | J | 2.4 | U | 9.8 | J | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 0.055 | J | 2.1 | U | 2.1 | U |
| Endosulfan I | 1.0 | J | 2.4 | U | 3.6 | J | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 2.1 | U |
| Dieldrin | 99 | U | 4.7 | U | 680 | | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 0.042 | J | 4.1 | U | 1.8 | J |
| 4,4'-DDE | 6.7 | J | 4.7 | U | 300 | J | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 0.32 | J | 4.1 | U | 3.1 | J |
| Endrin | 27 | J | 2.8 | J | 20 | U | 4.2 | U | 3.6 | U | 4.2 | U | 1.0 | J | 0.41 | J | 4.1 | U | 1.2 | J |
| Endosulfan II | 99 | U | 4.7 | U | 20 | U | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 4.4 | U | 4.1 | U | 4.1 | U |
| 4,4'-DDD | 31 | J | 2.0 | J | 3900 | | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 4.4 | U | 4.1 | U | 4.0 | J |
| Endosulfan sulfate | 99 | U | 4.7 | U | 49 | J | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 0.20 | J | 4.1 | U | 1.2 | J |
| 4,4'-DDT | 43 | J | 4.7 | U | 60 | J | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 4.4 | U | 4.1 | U | 2.8 | J |
| Methoxychlor | 35 | J | 24 | U | 100 | U | 22 | U | 18 | U | 22 | U | 21 | U | 1.7 | J | 21 | U | 1.5 | J |
| Endrin ketone | 7.8 | J | 1.1 | J | 6.7 | J | 4.2 | U | 3.6 | U | 4.2 | U | 1.7 | J | 0.19 | J | 4.1 | U | 4.1 | U |
| Endrin aldehyde | 17 | J | 1.6 | J | 170 | | 4.2 | U | 3.6 | U | 4.2 | U | 1.4 | J | 0.28 | J | 4.1 | U | 2.5 | J |
| alpha-Chlordane | 4.7 | J | 0.39 | J | 110 | J | 0.059 | J | 1.9 | U | 2.2 | U | 2.1 | U | 0.25 | J | 2.1 | U | 3.0 | J |
| gamma-Chlordane | 51 | U | 1.1 | J | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 6.8 | |
| Toxaphene | 5100 | U | 240 | U | 1000 | U | 220 | U | 180 | U | 220 | U | 210 | U | 230 | U | 210 | U | 210 | U |
| Aroclor-1016 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1221 | 2000 | U | 94 | U | 400 | U | 85 | U | 73 | U | 85 | U | 82 | U | 89 | U | 84 | U | 84 | U |
| Aroclor-1232 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1242 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1248 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1254 | 990 | U | 46 | U | 4100 | J | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1260 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |

# CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

## TABLE 3

Analytical Results (Qualified Data)



Case #: 28678

| | |
|---|---|
| Case #: 28678 | SDG : EE01K |
| Site : | CLARK OIL |
| Lab. : | LIBRTY |
| Reviewer : | |
| Date : | |

| Sample Number : | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture : | 16 | | 29 | | 29 | | 4 | | 26 | | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH : | 7.9 | | 7.9 | | 7.6 | | 7.4 | | 7.1 | | 7.6 | | 6.9 | | 8.0 | | 8.4 | | 8.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 2.0 | |
| **Pesticide/PCB Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| alpha-BHC | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 67 | J | 2.2 | U | 0.87 | J |
| beta-BHC | 2.0 | U | 610 | J | 2.4 | U | 3.5 | U | 2.3 | U | 12 | J | 14 | J | 4.2 | R | 2.4 | J | 18 | |
| delta-BHC | 2.0 | U | 190 | J | 2.4 | U | 4.6 | J | 2.3 | U | 2.1 | U | 2.1 | U | 4.2 | R | 2.2 | U | 3.5 | U |
| gamma-BHC (Lindane) | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 4.2 | R | 0.77 | J | 3.1 | J |
| Heptachlor | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 140 | J | 2.2 | U | 3.5 | U |
| Aldrin | 2.0 | U | 100 | J | 2.4 | U | 3.5 | U | 2.3 | U | 3.8 | J | 4.6 | J | 20 | J | 1.2 | J | 15 | J |
| Heptachlor epoxide | 2.0 | U | 2.4 | U | 2.4 | U | 1.7 | J | 2.3 | U | 6.1 | J | 11 | J | 20 | J | 2.2 | U | 29 | J |
| Endosulfan I | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 8.0 | J | 2.2 | U | 3.5 | U |
| Dieldrin | 3.9 | U | 15 | J | 4.7 | U | 36 | J | 4.5 | U | 12 | J | 17 | J | 40 | J | 4.2 | U | 58 | J |
| 4,4'-DDE | 3.9 | U | 4.7 | U | 4.7 | U | 6.5 | J | 4.5 | U | 4.0 | U | 4.1 | U | 69 | J | 4.2 | U | 130 | J |
| Endrin | 3.9 | U | 23 | J | 4.7 | U | 5.2 | J | 4.5 | U | 23 | J | 12 | J | 50 | J | 3.5 | J | 110 | J |
| Endosulfan II | 3.9 | U | 6.8 | J | 4.7 | U | 4.0 | J | 4.5 | U | 4.0 | U | 4.1 | U | 8.1 | R | 4.2 | U | 6.9 | U |
| 4,4'-DDD | 3.9 | U | 19 | J | 4.7 | U | 6.9 | U | 4.5 | U | 10 | J | 14 | J | 17 | J | 1.6 | J | 13 | J |
| Endosulfan sulfate | 3.9 | U | 4.7 | U | 4.7 | U | 6.9 | U | 4.5 | U | 13 | J | 18 | J | 8.1 | R | 4.2 | U | 66 | J |
| 4,4'-DDT | 3.9 | U | 20 | J | 4.7 | U | 6.9 | U | 4.5 | U | 34 | J | 47 | J | 42 | J | 4.2 | U | 6.9 | U |
| Methoxychlor | 20 | U | 24 | U | 24 | U | 35 | U | 23 | U | 21 | U | 21 | U | 41 | R | 22 | U | 35 | U |
| Endrin ketone | 3.9 | U | 9.8 | J | 4.7 | U | 140 | J | 4.5 | U | 6.2 | J | 9.6 | J | 46 | J | 4.2 | U | 150 | J |
| Endrin aldehyde | 3.9 | U | 4.7 | U | 4.7 | U | 86 | J | 4.5 | U | 22 | J | 32 | J | 8.1 | R | 1.8 | J | 52 | J |
| alpha-Chlordane | 2.0 | U | 59 | J | 2.4 | U | 40 | J | 2.3 | U | 6.0 | J | 9.7 | J | 4.2 | R | 2.2 | U | 150 | J |
| gamma-Chlordane | 2.0 | U | 41 | J | 2.4 | U | 1.8 | J | 2.3 | U | 6.2 | J | 9.9 | J | 28 | J | 2.2 | U | 520 | |
| Toxaphene | 200 | U | 240 | U | 240 | U | 350 | U | 230 | U | 210 | U | 210 | U | 410 | R | 220 | U | 350 | U |
| Aroclor-1016 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1221 | 80 | U | 94 | U | 94 | U | 140 | U | 91 | U | 82 | U | 83 | U | 160 | R | 86 | U | 140 | U |
| Aroclor-1232 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1242 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1248 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1254 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1260 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

### TABLE 3

Analytical Results (Qualified Data)



Case #: 28678 — SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | | 21 | | 24 | | 39 | | 26 | | 26 | |
| pH : | 7.0 | | 7.7 | | 7.5 | | 7.9 | | 6.5 | | 7.2 | | 7.7 | | 8.0 | | 8.5 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Pesticide/PCB Compound** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| alpha-BHC | 2.3 | U | 2.2 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| beta-BHC | 2.3 | U | 2.3 | U | 1.8 | U | 1.6 | J | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 0.93 | J | 2.3 | U |
| delta-BHC | 2.3 | U | 2.0 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| gamma-BHC (Lindane) | 2.3 | U | 4.0 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Heptachlor | 2.3 | U | 2.3 | U | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Aldrin | 2.3 | U | 1.0 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Heptachlor epoxide | 2.3 | U | 2.3 | U | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Endosulfan I | 2.3 | U | 2.3 | U | 1.8 | U | 0.52 | J | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Dieldrin | 4.5 | U | 1.5 | J | 3.5 | U | 19 | J | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDE | 4.5 | U | 4.4 | U | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endrin | 4.5 | U | 4.0 | J | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endosulfan II | 4.5 | U | 4.4 | U | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDD | 4.5 | U | 1.8 | J | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endosulfan sulfate | 4.5 | U | 4.4 | U | 3.5 | U | 25 | J | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDT | 4.5 | U | 3.8 | J | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Methoxychlor | 23 | U | 15 | J | 18 | U | 51 | J | 22 | U | 22 | U | 22 | U | 28 | UJ | 23 | U | 23 | U |
| Endrin ketone | 4.5 | U | 3.6 | J | 3.5 | U | 84 | J | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endrin aldehyde | 4.5 | U | 1.7 | J | 3.5 | U | 10 | J | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 1.7 | J | 4.5 | U |
| alpha-Chlordane | 2.3 | U | 1.6 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| gamma-Chlordane | 2.3 | U | 1.5 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Toxaphene | 230 | U | 230 | U | 180 | U | 200 | U | 220 | U | 220 | U | 220 | U | 280 | UJ | 230 | U | 230 | U |
| Aroclor-1016 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1221 | 92 | U | 89 | U | 71 | U | 79 | U | 86 | U | 85 | U | 88 | U | 110 | UJ | 91 | U | 91 | U |
| Aroclor-1232 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1242 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1248 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1254 | 45 | U | 44 | U | 35 | U | 1600 | J | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1260 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

### TABLE 4

Analytical Results (Qualified Data)



ase #: 28678 — SDG : MEE01B
ite : — CLARK OIL
ab. : — LIBRTY
eviewer : — J. GANZ
ate : — DECEMBER 12, 2000

| Sample Number : | MEE01M | | MEE01N | | MEE01P | | MEE01Q | | MEE01R | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | |
| latrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Jnits : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| Date Sampled : | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | |
| ime Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | |
| %Solids : | 81.3 | | 62.4 | | 74.2 | | 80.2 | | 73.9 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| ANALYTE | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| LUMINUM | 6840 | | 952 | | 11800 | | 193 | | 15100 | |
| NTIMONY | 0.53 | UJ | 26.5 | J | 0.71 | J | 0.57 | UJ | 0.65 | J |
| RSENIC | 5.9 | J | 2.4 | J | 3.7 | J | 1.0 | J | 5.2 | J |
| ARIUM | 164 | | 34.4 | | 842 | | 66.0 | | 247 | |
| ERYLLIUM | 0.43 | | 0.10 | J | 0.77 | | 0.049 | U | 1.0 | |
| ADMIUM | 0.070 | U | 26.8 | | 0.17 | J | 0.074 | U | 0.080 | U |
| ALCIUM | 2950 | J | 11100 | J | 4120 | J | 3150 | J | 5580 | J |
| HROMIUM | 11.3 | J | 196 | J | 14.1 | J | 5.0 | J | 16.6 | J |
| OBALT | 6.1 | | 2.8 | | 37.0 | | 0.96 | | 9.0 | |
| OPPER | 14.7 | | 333 | | 21.8 | | 12.4 | | 26.0 | |
| RON | 13500 | | 4670 | | 13900 | | 1430 | | 20300 | |
| EAD | 9.0 | J | 172 | J | 17.6 | J | 22.2 | J | 12.6 | J |
| AGNESIUM | 2920 | | 2410 | | 3420 | | 868 | | 3830 | |
| ANGANESE | 229 | J | 74.3 | J | 3900 | J | 22.7 | J | 599 | J |
| ERCURY | 0.098 | J | 0.37 | J | 0.073 | J | 0.081 | J | 0.069 | J |
| ICKEL | 18.8 | J | 70.2 | J | 29.9 | J | 3.1 | J | 21.9 | J |
| OTASSIUM | 784 | | 120 | | 993 | | 42.2 | | 1290 | |
| ELENIUM | 1.0 | UJ | 3.0 | J | 1.1 | UJ | 1.1 | UJ | 1.2 | UJ |
| ILVER | 0.093 | U | 1.0 | | 0.11 | U | 0.18 | | 0.11 | U |
| ODIUM | 262 | J | 298 | J | 1040 | J | 224 | J | 260 | J |
| HALLIUM | 7.8 | J | 3.1 | J | 7.0 | J | 1.4 | UJ | 9.9 | J |
| ANADIUM | 19.2 | | 403 | | 23.4 | | 5.3 | | 29.5 | |
| INC | 44.2 | J | 2480 | J | 44.5 | J | 39.1 | J | 55.0 | J |
| YANIDE | 0.055 | U | 0.64 | | 0.082 | J | 0.49 | | 0.076 | J |

| Sample Number : | MEE01S | | MEE01T | | MEE01W | | MEE01X | | MEE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X116 | | X117 | | X118 | | X119 | | X120 | |
| latrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Jnits : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| Date Sampled : | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | |
| ime Sampled : | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Solids : | 79.4 | | 78.4 | | 78.5 | | 75.1 | | 76.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| ANALYTE | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| LUMINUM | 9460 | | 24600 | | 448 | | 11000 | | 8240 | |
| NTIMONY | 0.64 | J | 1.2 | J | 0.83 | J | 0.57 | UJ | 1.0 | J |
| RSENIC | 5.4 | J | 14.2 | J | 2.0 | J | 6.1 | J | 9.1 | J |
| ARIUM | 238 | | 197 | | 14.6 | | 317 | | 155 | |
| ERYLLIUM | 0.64 | | 0.76 | | 0.049 | U | 0.63 | | 0.46 | |
| ADMIUM | 0.10 | J | 0.076 | U | 0.074 | U | 0.074 | U | 0.079 | U |
| ALCIUM | 23300 | J | 17600 | J | 7600 | J | 3680 | J | 15900 | J |
| HROMIUM | 126 | J | 127 | J | 24.2 | J | 16.7 | J | 76.6 | J |
| OBALT | 9.1 | | 8.9 | | 1.8 | | 6.5 | | 32.0 | |
| OPPER | 28.1 | | 39.9 | | 18.1 | | 19.8 | | 57.5 | |
| RON | 16000 | | 16800 | | 26500 | | 17800 | | 19800 | |
| EAD | 39.3 | J | 88.8 | J | 7.7 | J | 13.4 | J | 84.1 | J |
| AGNESIUM | 3900 | | 6100 | | 875 | | 3720 | | 3160 | |
| ANGANESE | 583 | J | 544 | J | 113 | J | 436 | J | 316 | J |
| ERCURY | 0.11 | J | 0.13 | J | 0.092 | J | 0.11 | J | 0.21 | J |
| ICKEL | 24.7 | J | 26.4 | J | 24.9 | J | 20.8 | J | 65.4 | J |
| OTASSIUM | 1180 | | 1490 | | 95.5 | | 1250 | | 874 | |
| ELENIUM | 2.6 | J | 1.5 | J | 9.6 | J | 1.1 | UJ | 1.7 | J |
| ILVER | 0.099 | U | 0.10 | U | 0.15 | | 0.099 | U | 0.10 | U |
| ODIUM | 268 | J | 349 | J | 246 | J | 328 | J | 494 | J |
| HALLIUM | 7.7 | J | 7.1 | J | 14.9 | J | 10.3 | J | 11.6 | J |
| ANADIUM | 63.6 | | 70.1 | | 334 | | 27.5 | | 53.5 | |
| INC | 139 | J | 217 | J | 33.8 | J | 62.2 | J | 95.9 | J |
| YANIDE | 0.39 | J | 0.41 | J | 2.8 | | 0.059 | U | 3.5 | |

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

**TABLE 4**

Analytical Results (Qualified Data) — Page 2

Case #: 28678 — SDG : MEE01B
Site : CLARK OIL
Lab. : LIBRTY
Reviewer : J. GANZ
Date : DECEMBER 12, 2000

| Sample Number : | MEE01M | | MEE01N | | MEE01P | | MEE01Q | | MEE01R | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| Date Sampled : | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | |
| %Solids : | 81.3 | | 62.4 | | 74.2 | | 80.2 | | 73.9 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **ANALYTE** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| ALUMINUM | 6840 | | 952 | | 11800 | | 193 | | 15100 | |
| ANTIMONY | 0.53 | UJ | 26.5 | J | 0.71 | J | 0.57 | UJ | 0.65 | J |
| ARSENIC | 5.9 | J | 2.4 | J | 3.7 | J | 1.0 | J | 5.2 | J |
| BARIUM | 164 | | 34.4 | | 842 | | 66.0 | | 247 | |
| BERYLLIUM | 0.43 | | 0.10 | J | 0.77 | | 0.049 | U | 1.0 | |
| CADMIUM | 0.070 | U | 26.8 | | 0.17 | J | 0.074 | U | 0.080 | U |
| CALCIUM | 2950 | J | 11100 | J | 4120 | J | 3150 | J | 5580 | J |
| CHROMIUM | 11.3 | J | 196 | J | 14.1 | J | 5.0 | J | 16.6 | J |
| COBALT | 6.1 | | 2.8 | | 37.0 | | 0.96 | | 9.0 | |
| COPPER | 14.7 | | 333 | | 21.8 | | 12.4 | | 26.0 | |
| IRON | 13500 | | 4670 | | 13900 | | 1430 | | 20300 | |
| LEAD | 9.0 | J | 172 | J | 17.6 | J | 22.2 | J | 12.6 | J |
| MAGNESIUM | 2920 | | 2410 | | 3420 | | 868 | | 3830 | |
| MANGANESE | 229 | J | 74.3 | J | 3900 | J | 22.7 | J | 598 | J |
| MERCURY | 0.098 | J | 0.37 | J | 0.073 | J | 0.081 | J | 0.069 | J |
| NICKEL | 18.8 | J | 70.2 | J | 29.9 | J | 3.1 | J | 21.9 | J |
| POTASSIUM | 784 | | 120 | | 993 | | 42.2 | | 1290 | |
| SELENIUM | 1.0 | UJ | 3.0 | J | 1.1 | UJ | 1.1 | UJ | 1.2 | UJ |
| SILVER | 0.093 | U | 1.0 | | 0.11 | U | 0.18 | | 0.11 | U |
| SODIUM | 262 | J | 298 | J | 1040 | J | 224 | J | 260 | J |
| THALLIUM | 7.8 | J | 3.1 | J | 7.0 | J | 1.4 | UJ | 9.9 | J |
| VANADIUM | 19.2 | | 403 | | 23.4 | | 5.3 | | 29.5 | |
| ZINC | 44.2 | J | 2480 | J | 44.5 | J | 39.1 | J | 55.0 | J |
| CYANIDE | 0.055 | U | 0.64 | | 0.082 | J | 0.49 | | 0.076 | J |

| Sample Number : | MEE01S | | MEE01T | | MEE01W | | MEE01X | | MEE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| Date Sampled : | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | |
| Time Sampled : | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Solids : | 79.4 | | 78.4 | | 78.5 | | 75.1 | | 76.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **ANALYTE** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| ALUMINUM | 9460 | | 24600 | | 448 | | 11000 | | 8240 | |
| ANTIMONY | 0.64 | J | 1.2 | J | 0.83 | J | 0.57 | UJ | 1.0 | J |
| ARSENIC | 5.4 | J | 14.2 | J | 2.0 | J | 6.1 | J | 9.1 | J |
| BARIUM | 238 | | 197 | | 14.6 | | 317 | | 155 | |
| BERYLLIUM | 0.64 | | 0.76 | | 0.049 | U | 0.63 | | 0.46 | |
| CADMIUM | 0.10 | J | 0.076 | U | 0.074 | U | 0.074 | U | 0.079 | U |
| CALCIUM | 23300 | J | 17600 | J | 7600 | J | 3680 | J | 15900 | J |
| CHROMIUM | 126 | J | 127 | J | 24.2 | J | 16.7 | J | 76.6 | J |
| COBALT | 9.1 | | 8.9 | | 1.8 | | 6.5 | | 32.0 | |
| COPPER | 28.1 | | 39.9 | | 18.1 | | 19.8 | | 57.5 | |
| IRON | 16000 | | 16800 | | 26500 | | 17800 | | 19800 | |
| LEAD | 39.3 | J | 88.8 | J | 7.7 | J | 13.4 | J | 84.1 | J |
| MAGNESIUM | 3900 | | 6100 | | 875 | | 3720 | | 3160 | |
| MANGANESE | 583 | J | 544 | J | 113 | J | 436 | J | 316 | J |
| MERCURY | 0.11 | J | 0.13 | J | 0.092 | J | 0.11 | J | 0.21 | J |
| NICKEL | 24.7 | J | 26.4 | J | 24.9 | J | 20.8 | J | 65.4 | J |
| POTASSIUM | 1180 | | 1490 | | 95.5 | | 1250 | | 874 | |
| SELENIUM | 2.6 | J | 1.5 | J | 9.6 | J | 1.1 | UJ | 1.7 | J |
| SILVER | 0.099 | U | 0.10 | U | 0.15 | | 0.099 | U | 0.10 | U |
| SODIUM | 268 | J | 349 | J | 246 | J | 328 | J | 494 | J |
| THALLIUM | 7.7 | J | 7.1 | J | 14.9 | J | 10.3 | J | 11.6 | J |
| VANADIUM | 63.6 | | 70.1 | | 334 | | 27.5 | | 53.5 | |
| ZINC | 139 | J | 217 | J | 33.8 | J | 62.2 | J | 95.9 | J |
| CYANIDE | 0.39 | J | 0.41 | J | 2.8 | | 0.059 | U | 3.5 | |

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

### TABLE 4

| Analytical Results (Qualified Data) | | Page 2 |
|---|---|---|
| ase #: 28678 | SDG : MEE01B | |
| te : | CLARK OIL | |
| ab. : | LIBRTY | |
| eviewer : | J. GANZ | |
| ate : | DECEMBER 12, 2000 | |

| ample Number : | MEE01M | | MEE01N | | MEE01P | | MEE01Q | | MEE01R | | MEE01S | | MEE01T | | MEE01W | | MEE01X | | MEE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| latrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| nits : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| ate Sampled : | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | |
| ime Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| Solids : | 81.3 | | 62.4 | | 74.2 | | 80.2 | | 73.9 | | 79.4 | | 78.4 | | 78.5 | | 75.1 | | 76.3 | |
| ilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **ANALYTE** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| LUMINUM | 6840 | | 952 | | 11800 | | 193 | | 15100 | | 9460 | | 24600 | | 448 | | 11000 | | 8240 | |
| NTIMONY | 0.53 | UJ | 26.5 | J | 0.71 | J | 0.57 | UJ | 0.65 | J | 0.64 | J | 1.2 | J | 0.83 | J | 0.57 | UJ | 1.0 | J |
| RSENIC | 6.9 | J | 2.4 | J | 3.7 | J | 1.0 | J | 5.2 | J | 5.4 | J | 14.2 | J | 2.0 | J | 6.1 | J | 9.1 | J |
| ARIUM | 164 | | 34.4 | | 842 | | 66.0 | | 247 | | 238 | | 197 | | 14.6 | | 317 | | 155 | |
| ERYLLIUM | 0.43 | | 0.10 | J | 0.77 | | 0.049 | U | 1.0 | | 0.64 | | 0.76 | | 0.049 | U | 0.63 | | 0.46 | |
| ADMIUM | 0.070 | U | 26.8 | | 0.17 | J | 0.074 | U | 0.080 | U | 0.10 | J | 0.076 | U | 0.074 | U | 0.074 | U | 0.079 | U |
| ALCIUM | 2950 | J | 11100 | J | 4120 | J | 3150 | J | 5580 | J | 23300 | J | 17600 | J | 7600 | J | 3680 | J | 15900 | J |
| HROMIUM | 11.3 | J | 196 | J | 14.1 | J | 5.0 | J | 16.6 | J | 126 | J | 127 | J | 24.2 | J | 16.7 | J | 76.6 | J |
| OBALT | 6.1 | | 2.8 | | 37.0 | | 0.96 | | 9.0 | | 9.1 | | 8.9 | | 1.8 | | 6.5 | | 32.0 | |
| OPPER | 14.7 | | 333 | | 21.8 | | 12.4 | | 26.0 | | 28.1 | | 39.9 | | 18.1 | | 19.8 | | 57.5 | |
| ON | 13500 | | 4670 | | 13900 | | 1430 | | 20300 | | 16000 | | 16800 | | 28500 | | 17800 | | 19800 | |
| AD | 9.0 | J | 172 | J | 17.6 | J | 22.2 | J | 12.6 | J | 39.3 | J | 88.8 | J | 7.7 | J | 13.4 | J | 84.1 | J |
| AGNESIUM | 2920 | | 2410 | | 3420 | | 868 | | 3830 | | 3900 | | 6100 | | 875 | | 3720 | | 3160 | |
| ANGANESE | 229 | J | 74.3 | J | 3900 | J | 22.7 | J | 599 | J | 583 | J | 544 | J | 113 | J | 436 | J | 316 | J |
| ERCURY | 0.098 | J | 0.37 | J | 0.073 | J | 0.081 | J | 0.069 | J | 0.11 | J | 0.13 | J | 0.092 | J | 0.11 | J | 0.21 | J |
| CKEL | 18.8 | J | 70.2 | J | 29.9 | J | 3.1 | J | 21.9 | J | 24.7 | J | 26.4 | J | 24.9 | J | 20.8 | J | 65.4 | J |
| OTASSIUM | 784 | | 120 | | 993 | | 42.2 | | 1290 | | 1180 | | 1490 | | 95.5 | | 1250 | | 874 | |
| ELENIUM | 1.0 | UJ | 3.0 | J | 1.1 | UJ | 1.1 | UJ | 1.2 | UJ | 2.6 | J | 1.5 | J | 9.6 | J | 1.1 | UJ | 1.7 | J |
| LVER | 0.093 | U | 1.0 | | 0.11 | U | 0.18 | | 0.11 | U | 0.099 | U | 0.10 | U | 0.15 | | 0.099 | U | 0.10 | U |
| ODIUM | 262 | J | 298 | J | 1040 | J | 224 | J | 260 | J | 268 | J | 349 | J | 246 | J | 328 | J | 494 | J |
| IALLIUM | 7.8 | J | 3.1 | J | 7.0 | J | 1.4 | UJ | 9.9 | J | 7.7 | J | 7.1 | J | 14.9 | J | 10.3 | J | 11.6 | J |
| ANADIUM | 19.2 | | 403 | | 23.4 | | 5.3 | | 29.5 | | 63.6 | | 70.1 | | 334 | | 27.5 | | 53.5 | ) |
| NC | 44.2 | J | 2480 | J | 44.5 | J | 39.1 | J | 55.0 | J | 139 | J | 217 | U | 33.8 | J | 62.2 | J | 95.9 | J |
| ANIDE | 0.055 | U | 0.64 | | 0.082 | J | 0.49 | | 0.076 | J | 0.39 | J | 0.41 | J | 2.8 | | 0.059 | U | 3.5 | |

# CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 8

| Analytical Results (Qualified Data) | Page 1 |
|---|---|
| Case #: 28678 | SDG : EE01B |
| Site : | CLARK OIL |
| Lab. : | LIBRTY |
| Reviewer : | |
| Date : | |

| Sample Number : | EE01B | | EE01C | | EE01D | | EE01E | | EE01F | | EE01G | | EE01H | | EE01J | | EE01K | | EE01L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X101 | | X102 | | X103 | | X104 | | X105 | | X106 | | X107 | | X108 | | X109 | | X110 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 11:30 | | 11:30 | | 12:50 | | 13:10 | | 15:00 | | 15:20 | | 16:00 | | 16:45 | | 08:15 | | 09:25 | |
| %Moisture : | 0 | | 29 | | 16 | | 22 | | 8 | | 21 | | 18 | | 25 | | 20 | | 20 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Volatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| Dichlorodifluoromethane | 19 | U | 14 | UJ | 11 | U | 11 | UJ | 10 | UJ | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Chloromethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Vinyl Chloride | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Bromomethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 160 | J | 22 | U | 12 | U | 11 | U |
| Chloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| Trichlorofluoromethane | 19 | U | 14 | UJ | 11 | U | 11 | UJ | 1 | J | 1100 | UJ | 1100 | UJ | 22 | U | 12 | U | 11 | U |
| 1,1-Dichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Acetone | 110 | J | 36 | UJ | 50 | J | 11 | U | 200 | J | 1100 | U | 1100 | U | 200 | J | 11 | J | 19 | UJ |
| Carbon Disulfide | 19 | U | 2 | J | 11 | U | 11 | UJ | 2 | J | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Methyl Acetate | 8 | J | 14 | UJ | 11 | UJ | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | UJ | 6 | J | 11 | UJ |
| Methylene Chloride | 19 | U | 14 | U | 11 | U | 11 | U | 16 | U | 1100 | U | 140 | J | 22 | U | 16 | | 11 | U |
| trans-1,2-Dichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Methyl tert-Butyl Ether | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,1-Dichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| cis-1,2-Dichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 2-Butanone | 73 | J | 6 | J | 8 | J | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | UJ | 12 | UJ | 11 | U |
| Chloroform | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 1 | J |
| 1,1,1-Trichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Cyclohexane | 4 | J | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 1 | J |
| Carbon Tetrachloride | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Benzene | 19 | U | 14 | U | 11 | U | 2 | J | 10 | U | 200 | J | 1400 | J | 6 | J | 12 | U | 2 | J |
| 1,2-Dichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Trichloroethene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Methylcyclohexane | 4 | J | 14 | U | 11 | U | 4 | J | 10 | U | 9100 | | 2800 | J | 180 | | 12 | U | 3 | J |
| 1,2-Dichloropropane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Bromodichloromethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| cis-1,3-Dichloropropene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 4-Methyl-2-pentanone | 12 | J | 14 | UJ | 11 | U | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Toluene | 19 | U | 4 | J | 2 | J | 3 | J | 9 | J | 1100 | U | 810 | J | 22 | U | 2 | J | 3 | J |
| trans-1,3-Dichloropropene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,1,2-Trichloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Tetrachloroethene | 19 | U | 1 | J | 11 | U | 2 | J | 2 | J | 1100 | U | 1100 | U | 22 | U | 2 | J | 11 | U |
| 2-Hexanone | 19 | U | 14 | UJ | 11 | U | 11 | UJ | 10 | UJ | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Dibromochloromethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2-Dibromoethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Chlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Ethylbenzene | 19 | U | 14 | U | 11 | U | 11 | U | 5 | J | 1400 | | 5300 | J | 22 | U | 12 | U | 11 | U |
| Xylenes (total) | 19 | U | 42 | | 11 | U | 11 | U | 10 | | 180 | J | 35000 | J | 220 | | 12 | U | 5 | J |
| Styrene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 150 | J | 22 | U | 12 | U | 11 | U |
| Bromoform | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| Isopropylbenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | | 420 | J | 400 | J | 13 | J | 12 | U | 11 | U |
| 1,1,2,2-Tetrachloroethane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,3-Dichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,4-Dichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2-Dichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2-Dibromo-3-chloropropane | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |
| 1,2,4-Trichlorobenzene | 19 | U | 14 | U | 11 | U | 11 | U | 10 | U | 1100 | U | 1100 | U | 22 | U | 12 | U | 11 | U |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 5

Analytical Results (Qualified Data)



Case #: 28678
SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture : | 16 | | 29 | | 29 | | 4 | | 26 | | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Volatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| Dichlorodifluoromethane | 12 | U | 70 | U | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Vinyl Chloride | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromomethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Trichlorofluoromethane | 12 | U | 70 | U | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Acetone | 43 | J | 70 | UJ | 23 | J | 8000 | UJ | 34 | UJ | 49 | J | 52 | J | 20 | UJ | 210 | J | 130 | J |
| Carbon Disulfide | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methyl Acetate | 12 | UJ | 70 | UJ | 14 | UJ | 8000 | U | 13 | UJ | 14 | UJ | 14 | UJ | 20 | UJ | 64 | UJ | 9 | UJ |
| Methylene Chloride | 17 | | 70 | U | 22 | | 8000 | U | 14 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| trans-1,2-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methyl tert-Butyl Ether | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1-Dichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| cis-1,2-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 2-Butanone | 23 | J | 70 | U | 5 | J | 8000 | UJ | 6 | J | 9 | J | 14 | U | 20 | U | 33 | J | 22 | |
| Chloroform | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,1-Trichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Cyclohexane | 12 | U | 200 | | 14 | U | 58000 | | 1 | J | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Carbon Tetrachloride | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Benzene | 12 | U | 70 | U | 14 | U | 7100 | J | 3 | J | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Trichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methylcyclohexane | 1 | J | 710 | | 14 | U | 130000 | | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 1 | J |
| 1,2-Dichloropropane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromodichloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| cis-1,3-Dichloropropene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 4-Methyl-2-pentanone | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Toluene | 2 | J | 16 | J | 3 | J | 1800 | J | 2 | J | 2 | J | 14 | U | 20 | U | 64 | U | 2 | J |
| trans-1,3-Dichloropropene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2-Trichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Tetrachloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 1 | J | 3 | J | 64 | U | 9 | U |
| 2-Hexanone | 12 | U | 70 | UJ | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | UJ | 20 | UJ | 64 | UJ | 9 | UJ |
| Dibromochloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dibromoethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Ethylbenzene | 12 | U | 30 | J | 14 | U | 10000 | | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Xylenes (total) | 12 | U | 1000 | | 14 | U | 34000 | | 2 | J | 14 | U | 14 | U | 20 | U | 64 | U | 4 | J |
| Styrene | 12 | U | 20 | J | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromoform | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Isopropylbenzene | 12 | U | 39 | J | 14 | U | 2900 | J | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2,2-Tetrachloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,3-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,4-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dibromo-3-chloropropane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2,4-Trichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

## CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

### KEY SAMPLES
### TABLE 6



**Analytical Results (Qualified Data)**

Case #: 28678
SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | | 21 | | 24 | | 39 | | 28 | | 26 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| | | | | | | | | | Background | | | | | | | | | | | |
| **Volatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| Dichlorodifluoromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Vinyl Chloride | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromomethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Trichlorofluoromethane | 12 | U | 13 | U | 12 | U | 10 | U | 1 | J | 14 | UJ | 11 | UJ | 16 | UJ | 2 | J | 16000 | U |
| 1,1-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Acetone | 23 | J | 17 | J | 21 | J | 24 | J | 48 | J | 14 | UJ | 160 | J | 29 | UJ | 49 | J | 24000 | |
| Carbon Disulfide | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 2 | J | 16 | UJ | 4 | J | 16000 | U |
| Methyl Acetate | 12 | UJ | 13 | UJ | 12 | UJ | 10 | UJ | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Methylene Chloride | 15 | | 13 | U | 16 | | 10 | U | 11 | U | 24 | U | 18 | U | 17 | U | 17 | U | 4100 | J |
| trans-1,2-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Methyl tert-Butyl Ether | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1-Dichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| cis-1,2-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 2-Butanone | 12 | UJ | 13 | UJ | 4 | J | 10 | UJ | 4 | J | 14 | UJ | 23 | J | 16 | UJ | 12 | UJ | 16000 | U |
| Chloroform | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,1-Trichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Cyclohexane | 12 | U | 13 | U | 12 | U | 2 | J | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Carbon Tetrachloride | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Benzene | 12 | U | 13 | U | 12 | U | 1 | J | 11 | U | 14 | U | 11 | U | 16 | U | 53 | | 34000 | J |
| 1,2-Dichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Trichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Methylcyclohexane | 12 | U | 13 | U | 12 | U | 3 | J | 11 | U | 14 | U | 11 | U | 16 | U | 120 | | 89000 | |
| 1,2-Dichloropropane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromodichloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| cis-1,3-Dichloropropene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 4-Methyl-2-pentanone | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Toluene | 1 | J | 13 | U | 2 | J | 4 | J | 11 | U | 2 | J | 3 | J | 16 | U | 4 | J | 16000 | U |
| trans-1,3-Dichloropropene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,2-Trichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Tetrachloroethene | 2 | J | 2 | J | 12 | U | 1 | J | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 2-Hexanone | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Dibromochloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dibromoethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Ethylbenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 3 | J | 110000 | |
| Xylenes (total) | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 4 | J | 11 | U | 16 | U | 8 | J | 160000 | |
| Styrene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromoform | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Isopropylbenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 18 | | 17000 | |
| 1,1,2,2-Tetrachloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,3-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,4-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dibromo-3-chloropropane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | UJ |
| 1,2,4-Trichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

## CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 6

Analytical Results (Qualified Data)



| | |
|---|---|
| Case #: 28678 | SDG : EE01B |
| Site : | CLARK OIL |
| Lab. : | LIBRTY |
| Reviewer : | |
| Date : | |

| Sample Number : | EE01B | | EE01C | | EE01D | | EE01E | | EE01F | | EE01G | | EE01H | | EE01J | | EE01K | | EE01L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X101 | | X102 | | X103 | | X104 | | X105 | | X106 | | X107 | | X108 | | X109 | | X110 |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg |
| Date Sampled : | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/02/2000 | | 11/02/2000 |
| Time Sampled : | 11:30 | | 11:30 | | 12:50 | | 13:10 | | 15:00 | | 15:20 | | 18:00 | | 16:45 | | 08:15 | | 09:25 |
| %Moisture : | 0 | | 29 | | 16 | | 21 | | 8 | | 21 | | 18 | | 25 | | 20 | | 20 |
| pH : | 0.0 | | 7.7 | | 7.7 | | 8.0 | | 6.6 | | 7.9 | | 7.7 | | 8.4 | | 5.8 | | 8.5 |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 1.0 | | 1.0 |
| **Semivolatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** |
| Benzaldehyde | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Phenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| bis-(2-Chloroethyl) ether | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2-Chlorophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2-Methylphenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2,2'-oxybis(1-Chloropropane) | 9000 | UJ | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Acetophenone | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 4-Methylphenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| N-Nitroso-di-n-propylamine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Hexachloroethane | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Nitrobenzene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 |
| Isophorone | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2-Nitrophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2,4-Dimethylphenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| bis(2-Chloroethoxy)methane | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2,4-Dichlorophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Naphthalene | 9000 | U | 460 | U | 390 | U | 420 | U | 250 | J | 150 | J | 2500 | | 440 | U | 410 | U | 410 |
| 4-Chloroaniline | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Hexachlorobutadiene | 9000 | UJ | 460 | UJ | 390 | UJ | 420 | UJ | 360 | UJ | 420 | UJ | 800 | UJ | 440 | UJ | 410 | U | 410 |
| Caprolactam | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 4-Chloro-3-methylphenol | 9000 | U | 460 | UJ | 390 | UJ | 420 | UJ | 360 | UJ | 420 | UJ | 800 | U | 440 | UJ | 410 | U | 410 |
| 2-Methylnaphthalene | 9000 | U | 460 | U | 110 | J | 420 | U | 890 | | 1100 | | 2000 | | 440 | U | 410 | U | 73 |
| Hexachlorocyclopentadiene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 |
| 2,4,6-Trichlorophenol | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2,4,5-Trichlorophenol | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 |
| 1,1'-Biphenyl | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 110 | J | 440 | U | 410 | U | 410 |
| 2-Chloronaphthalene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2-Nitroaniline | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 |
| Dimethylphthalate | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 2,6-Dinitrotoluene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Acenaphthylene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 3-Nitroaniline | 23000 | UJ | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 |
| Acenaphthene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 50 | J | 410 | U | 200 |
| 2,4-Dinitrophenol | 23000 | U | 1200 | UJ | 990 | UJ | 1100 | UJ | 900 | UJ | 1100 | UJ | 2000 | U | 1100 | UJ | 1000 | U | 1000 |
| 4-Nitrophenol | 23000 | UJ | 1200 | UJ | 990 | UJ | 1100 | UJ | 900 | UJ | 1100 | UJ | 2000 | UJ | 1100 | UJ | 1000 | U | 1000 |
| Dibenzofuran | 9000 | U | 460 | U | 42 | J | 420 | U | 360 | U | 420 | U | 800 | U | 47 | J | 410 | U | 410 |
| 2,4-Dinitrotoluene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Diethylphthalate | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Fluorene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 66 | J | 410 | U | 100 |
| 4-Chlorophenyl-phenyl ether | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 |
| 4-Nitroaniline | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 |
| 4,6-Dinitro-2-methylphenol | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 |
| N-Nitrosodiphenylamine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 4-Bromophenyl-phenylether | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Hexachlorobenzene | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Atrazine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Pentachlorophenol | 23000 | U | 1200 | U | 990 | U | 1100 | U | 900 | U | 1100 | U | 2000 | U | 1100 | U | 1000 | U | 1000 |
| Phenanthrene | 9000 | U | 460 | U | 250 | J | 420 | U | 360 | U | 420 | U | 180 | J | 69 | J | 410 | U | 280 |
| Anthracene | 9000 | U | 460 | U | 50 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 200 |
| Carbazole | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Di-n-butylphthalate | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Fluoranthene | 9000 | U | 460 | UJ | 260 | J | 420 | UJ | 360 | UJ | 420 | UJ | 800 | U | 440 | UJ | 410 | U | 410 |
| Pyrene | 9000 | U | 200 | J | 350 | J | 420 | U | 360 | U | 420 | U | 370 | J | 46 | J | 410 | U | 2000 |
| Butylbenzylphthalate | 9000 | UJ | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| 3,3'-Dichlorobenzidine | 9000 | U | 460 | U | 390 | U | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 410 |
| Benzo(a)anthracene | 9000 | U | 460 | U | 130 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Chrysene | 9000 | U | 96 | J | 160 | J | 420 | U | 360 | U | 420 | U | 120 | J | 440 | U | 410 | U | 920 |
| bis(2-Ethylhexyl)phthalate | 9000 | U | 220 | J | 52 | J | 420 | U | 850 | | 600 | | 800 | U | 460 | | 410 | U | 3500 |
| Di-n-octylphthalate | 9000 | U | 1000 | | 390 | U | 120 | J | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Benzo(b)fluoranthene | 9000 | U | 460 | U | 240 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 180 |
| Benzo(k)fluoranthene | 9000 | U | 460 | U | 190 | J | 420 | U | 360 | U | 420 | U | 800 | UJ | 440 | U | 410 | U | 160 |
| Benzo(a)pyrene | 9000 | U | 460 | U | 130 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 330 |
| Indeno(1,2,3-cd)pyrene | 9000 | U | 460 | U | 81 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 55 |
| Dibenzo(a,h)anthracene | 9000 | U | 460 | U | 45 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 410 |
| Benzo(g,h,i)perylene | 9000 | U | 460 | U | 100 | J | 420 | U | 360 | U | 420 | U | 800 | U | 440 | U | 410 | U | 170 |

Highlighted entries are at least three times background; some will be ten times background if background level is estimated.

**CLARK OIL & REFINING COMPANY**
HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 6



Analytical Results (Qualified Data)

Case #: 28678
Site :
Lab. :
Reviewer :
Date :

SDG : EE01K
CLARK OIL
LIBRTY

| Sample Number : | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture : | 16 | | 29 | | 29 | | 4 | | 26 | | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH : | 7.9 | | 7.9 | | 7.6 | | 7.4 | | 7.1 | | 7.6 | | 6.9 | | 8.0 | | 8.4 | | 8.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Semivolatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| Benzaldehyde | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Phenol | 390 | U | 80000 | J | 460 | U | 31000 | U | 450 | U | 2000 | | 450 | J | 130000 | | 420 | U | 84 | [illegible] |
| bis-(2-Chloroethyl) ether | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Chlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Methylphenol | 390 | U | 2300 | J | 460 | U | 31000 | U | 450 | U | 800 | | 260 | J | 4100 | J | 420 | U | 52 | [illegible] |
| 2,2'-oxybis(1-Chloropropane) | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Acetophenone | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Methylphenol | 390 | U | 30000 | | 460 | U | 31000 | U | 450 | U | 1600 | | 460 | J | 51000 | | 46 | J | 120 | [illegible] |
| N-Nitroso-di-n-propylamine | 390 | U | 14000 | UJ | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Hexachloroethane | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Nitrobenzene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Isophorone | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Nitrophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,4-Dimethylphenol | 390 | U | 2900 | J | 460 | U | 31000 | U | 450 | U | 380 | J | 130 | J | 12000 | U | 420 | U | 340 | U |
| bis(2-Chloroethoxy)methane | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,4-Dichlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Naphthalene | 390 | U | 21000 | | 460 | U | 31000 | U | 450 | U | 2200 | | 960 | | 19000 | | 420 | U | 450 | [illegible] |
| 4-Chloroaniline | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Hexachlorobutadiene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Caprolactam | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Chloro-3-methylphenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Methylnaphthalene | 390 | U | 94000 | | 460 | U | 7000 | J | 50 | J | 10000 | | 2800 | | 100000 | | 89 | J | 1900 | |
| Hexachlorocyclopentadiene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | UJ | 12000 | U | 420 | U | 340 | U |
| 2,4,6-Trichlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,4,5-Trichlorophenol | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| 1,1'-Biphenyl | 390 | U | 5500 | J | 460 | U | 31000 | U | 450 | U | 200 | J | 110 | J | 5100 | J | 420 | U | 340 | U |
| 2-Chloronaphthalene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Dimethylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,6-Dinitrotoluene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Acenaphthylene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 3-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Acenaphthene | 390 | U | 6500 | J | 460 | U | 31000 | U | 450 | U | 140 | J | 810 | U | 10000 | J | 420 | U | 120 | J |
| 2,4-Dinitrophenol | 990 | U | 35000 | U | 1200 | U | 78000 | UJ | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| 4-Nitrophenol | 990 | U | 35000 | U | 1200 | U | 78000 | UJ | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Dibenzofuran | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 420 | | 120 | J | 12000 | U | 420 | U | 340 | U |
| 2,4-Dinitrotoluene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Diethylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Fluorene | 390 | U | 10000 | J | 460 | U | 5500 | J | 450 | U | 280 | J | 85 | J | 22000 | | 83 | J | 420 | |
| 4-Chlorophenyl-phenyl ether | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | UJ | 1000 | U | 2000 | U | 30000 | U | 1100 | UJ | 860 | UJ |
| 4,6-Dinitro-2-methylphenol | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| N-Nitrosodiphenylamine | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Bromophenyl-phenylether | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Hexachlorobenzene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Atrazine | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Pentachlorophenol | 990 | U | 35000 | R | 1200 | U | 78000 | U | 1100 | U | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Phenanthrene | 390 | U | 24000 | | 460 | U | 29000 | J | 450 | U | 780 | | 300 | J | 35000 | | 190 | J | 1200 | |
| Anthracene | 390 | U | 5300 | J | 460 | U | 31000 | U | 450 | U | 210 | J | 110 | J | 9300 | J | 420 | U | 110 | J |
| Carbazole | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | UJ | 75 | J | 810 | U | 4000 | J | 420 | UJ | 340 | U |
| Di-n-butylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Fluoranthene | 390 | U | 3200 | J | 460 | U | 31000 | U | 450 | U | 78 | J | 810 | U | 2100 | J | 220 | J | 160 | J |
| Pyrene | 390 | U | 13000 | J | 460 | U | 150000 | | 450 | U | 300 | J | 200 | J | 8000 | J | 990 | | 1100 | |
| Butylbenzylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 3,3'-Dichlorobenzidine | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Benzo(a)anthracene | 390 | U | 7000 | J | 460 | U | 60000 | | 450 | U | 260 | J | 160 | J | 6300 | J | 310 | J | 340 | J |
| Chrysene | 390 | U | 9800 | J | 460 | U | 120000 | | 450 | U | 400 | | 280 | J | 7300 | J | 550 | | 760 | |
| bis(2-Ethylhexyl)phthalate | 390 | U | 11000 | J | 460 | U | 31000 | U | 450 | U | 74 | J | 810 | U | 12000 | U | 10000 | | 160 | J |
| Di-n-octylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Benzo(b)fluoranthene | 390 | U | 2800 | J | 460 | U | 16000 | J | 450 | U | 240 | J | 130 | J | 2900 | J | 110 | J | 230 | J |
| Benzo(k)fluoranthene | 390 | U | 2900 | J | 460 | U | 31000 | UJ | 450 | U | 220 | J | 140 | J | 3100 | J | 87 | J | 210 | J |
| Benzo(a)pyrene | 390 | U | 5700 | J | 460 | U | 31000 | | 450 | U | 330 | J | 190 | J | 6600 | J | 120 | J | 330 | J |
| Indeno(1,2,3-cd)pyrene | 390 | U | 2000 | J | 460 | U | 7500 | J | 450 | U | 140 | J | 87 | J | 2400 | J | 420 | U | 100 | J |
| Dibenzo(a,h)anthracene | 390 | U | 3000 | J | 460 | U | 8400 | J | 450 | U | 180 | J | 110 | J | 4100 | J | 51 | J | 81 | J |
| Benzo(g,h,i)perylene | 390 | U | 3100 | J | 460 | U | 18000 | J | 450 | U | 640 | | 380 | J | 3800 | J | 52 | J | 220 | J |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 6

Analytical Results (Qualified Data)



Case #: 28678
Site :
Lab. :
Reviewer :
Date :

SDG : EE01K
CLARK OIL
LIBRTY

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 27 | | 25 | | 8 | | 15 | | 22 | | 21 | | 24 | | 39 | | 26 | | 26 | |
| pH : | 7.0 | | 7.7 | | 7.5 | | 7.9 | | 6.5 | | 7.2 | | 7.7 | | 8.0 | | 8.5 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| | | | | | | | | | Background | | | | | | | | | | | |
| Semivolatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| Benzaldehyde | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Phenol | 450 | U | 440 | U | 350 | U | 100 | J | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| bis-(2-Chloroethyl) ether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 2-Chlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 2-Methylphenol | 450 | U | 440 | U | 350 | U | 58 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 2,2'-oxybis(1-Chloropropane) | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Acetophenone | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 4-Methylphenol | 450 | U | 440 | U | 350 | U | 110 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| N-Nitroso-di-n-propylamine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Hexachloroethane | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Nitrobenzene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Isophorone | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 2-Nitrophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 460 | U | 450 | |
| 2,4-Dimethylphenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| bis(2-Chloroethoxy)methane | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 2,4-Dichlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Naphthalene | 450 | U | 440 | U | 350 | U | 180 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 660 | |
| 4-Chloroaniline | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Hexachlorobutadiene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| Caprolactam | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 4-Chloro-3-methylphenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | |
| 2-Methylnaphthalene | 450 | U | 440 | U | 350 | U | 850 | | 420 | U | 420 | U | 430 | U | 540 | U | 220 | J | 5100 | |
| Hexachlorocyclopentadiene | 450 | UJ | 440 | U | 350 | UJ | 390 | UJ | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,4,6-Trichlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,4,5-Trichlorophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| 1,1'-Biphenyl | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 88 | J |
| 2-Chloronaphthalene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2-Nitroaniline | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| Dimethylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,6-Dinitrotoluene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Acenaphthylene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 3-Nitroaniline | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| Acenaphthene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 120 | J |
| 2,4-Dinitrophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | UJ | 1100 | UJ | 1100 | U |
| 4-Nitrophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | UJ | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| Dibenzofuran | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 140 | J |
| 2,4-Dinitrotoluene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Diethylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Fluorene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 270 | J |
| 4-Chlorophenyl-phenyl ether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 4-Nitroaniline | 1100 | U | 1100 | UJ | 880 | U | 980 | U | 1100 | U | 1100 | UJ | 1100 | UJ | 1400 | UJ | 1100 | UJ | 1100 | U |
| 4,6-Dinitro-2-methylphenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| N-Nitrosodiphenylamine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 4-Bromophenyl-phenylether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Hexachlorobenzene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Atrazine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Pentachlorophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | UJ | 1100 | UJ | 1100 | UJ | 1400 | U | 1100 | U | 1100 | U |
| Phenanthrene | 450 | U | 440 | U | 350 | U | 160 | J | 420 | U | 420 | U | 430 | U | 540 | U | 140 | J | 770 | |
| Anthracene | 450 | U | 440 | U | 350 | U | 70 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 88 | J |
| Carbazole | 450 | U | 440 | UJ | 350 | U | 43 | J | 420 | U | 420 | UJ | 430 | UJ | 540 | UJ | 450 | UJ | 450 | U |
| Di-n-butylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Fluoranthene | 450 | U | 440 | U | 350 | U | 220 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Pyrene | 450 | U | 110 | J | 350 | U | 230 | J | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 74 | J |
| Butylbenzylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 3,3'-Dichlorobenzidine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | UJ | 430 | UJ | 540 | U | 450 | U | 450 | U |
| Benzo(a)anthracene | 450 | U | 440 | U | 350 | U | 160 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Chrysene | 450 | U | 74 | J | 350 | U | 190 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| bis(2-Ethylhexyl)phthalate | 450 | U | 45 | J | 73 | J | 89 | J | 420 | U | 420 | U | 430 | U | 80 | J | 450 | U | 450 | U |
| Di-n-octylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(b)fluoranthene | 450 | U | 440 | U | 350 | U | 130 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(k)fluoranthene | 450 | U | 440 | U | 350 | U | 120 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(a)pyrene | 450 | U | 440 | U | 350 | U | 100 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Indeno(1,2,3-cd)pyrene | 450 | U | 440 | U | 350 | U | 86 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Dibenzo(a,h)anthracene | 450 | U | 440 | U | 350 | U | 56 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(g,h,i)perylene | 450 | U | 440 | U | 350 | U | 190 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

**CLARK OIL & REFINING COMPANY**
HARTFORD, ILLINOIS

**KEY SAMPLES**
**TABLE 7**

| Analytical Results (Qualified Data) | | Page 1 |
|---|---|---|
| Case #: 28678 | SDG : EE01B | |
| Site : | CLARK OIL | |
| Lab. : | LIBRTY | |
| Reviewer : | | |
| Date : | | |

| Sample Number : | EE01B | | EE01C | | EE01D | | EE01E | | EE01F | | EE01G | | EE01H | | EE01J | | EE01K | | EE01L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X101 | | X102 | | X103 | | X104 | | X105 | | X106 | | X107 | | X108 | | X109 | | X110 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 11:30 | | 11:30 | | 12:50 | | 13:10 | | 15:00 | | 15:20 | | 16:00 | | 16:45 | | 08:15 | | 09:25 | |
| %Moisture : | 0 | | 29 | | 16 | | 21 | | 8 | | 21 | | 18 | | 25 | | 20 | | 20 | |
| pH : | 0.0 | | 7.7 | | 7.7 | | 8.0 | | 6.6 | | 7.9 | | 7.7 | | 8.4 | | 5.8 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 5.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Pesticide/PCB Compound** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| alpha-BHC | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 0.61 | J | 2.1 | U | 2.1 | U |
| beta-BHC | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 1.4 | J | 2.3 | U | 2.1 | U | 2.1 | U |
| delta-BHC | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 2.1 | U |
| gamma-BHC (Lindane) | 51 | U | 0.75 | J | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 0.23 | J | 2.3 | U | 2.1 | U | 1.9 | J |
| Heptachlor | 51 | U | 2.4 | U | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 2.1 | U |
| Aldrin | 51 | U | 2.4 | U | 18 | | 2.2 | U | 1.9 | U | 2.2 | U | 0.47 | J | 0.88 | J | 2.1 | U | 0.82 | J |
| Heptachlor epoxide | 4.3 | J | 2.4 | U | 9.8 | J | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 0.055 | J | 2.1 | U | 2.1 | U |
| Endosulfan I | 1.0 | J | 2.4 | U | 3.6 | J | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 2.1 | U |
| Dieldrin | 99 | U | 4.7 | U | 680 | | 4.2 | U | 3.8 | U | 4.2 | U | 4.0 | U | 0.042 | J | 4.1 | U | 1.8 | J |
| 4,4'-DDE | 6.7 | J | 4.7 | U | 300 | J | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 0.32 | J | 4.1 | U | 3.1 | J |
| Endrin | 27 | J | 2.8 | J | 20 | U | 4.2 | U | 3.6 | U | 4.2 | U | 1.0 | J | 0.41 | J | 4.1 | U | 1.2 | J |
| Endosulfan II | 99 | U | 4.7 | U | 20 | U | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 4.4 | U | 4.1 | U | 4.1 | U |
| 4,4'-DDD | 31 | J | 2.0 | J | 3900 | | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 4.4 | U | 4.1 | U | 4.0 | J |
| Endosulfan sulfate | 99 | U | 4.7 | U | 49 | J | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 0.20 | J | 4.1 | U | 1.2 | J |
| 4,4'-DDT | 43 | J | 4.7 | U | 60 | J | 4.2 | U | 3.6 | U | 4.2 | U | 4.0 | U | 4.4 | U | 4.1 | U | 2.8 | J |
| Methoxychlor | 35 | J | 24 | U | 100 | U | 22 | U | 18 | U | 22 | U | 21 | U | 1.7 | J | 21 | U | 1.5 | J |
| Endrin ketone | 7.8 | J | 1.1 | J | 6.7 | J | 4.2 | U | 3.6 | U | 4.2 | U | 1.7 | J | 0.19 | J | 4.1 | U | 4.1 | U |
| Endrin aldehyde | 17 | J | 1.6 | J | 170 | | 4.2 | U | 3.6 | U | 4.2 | U | 1.4 | J | 0.28 | J | 4.1 | U | 2.5 | J |
| alpha-Chlordane | 4.7 | J | 0.39 | J | 110 | J | 0.059 | J | 1.9 | U | 2.2 | U | 2.1 | U | 0.25 | J | 2.1 | U | 3.0 | J |
| gamma-Chlordane | 51 | U | 1.1 | J | 10 | U | 2.2 | U | 1.9 | U | 2.2 | U | 2.1 | U | 2.3 | U | 2.1 | U | 6.8 | |
| Toxaphene | 5100 | U | 240 | U | 1000 | U | 220 | U | 180 | U | 220 | U | 210 | U | 230 | U | 210 | U | 210 | U |
| Aroclor-1016 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1221 | 2000 | U | 94 | U | 400 | U | 85 | U | 73 | U | 85 | U | 82 | U | 89 | U | 84 | U | 84 | U |
| Aroclor-1232 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1242 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1248 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1254 | 990 | U | 46 | U | 4100 | J | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |
| Aroclor-1260 | 990 | U | 46 | U | 200 | U | 42 | U | 36 | U | 42 | U | 40 | U | 44 | U | 41 | U | 41 | U |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

# CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

## KEY SAMPLES
## TABLE 7

**Analytical Results (Qualified Data)**

Page 2

Case #: 28678 SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture : | 16 | | 29 | | 29 | | 4 | | 26 | | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH : | 7.9 | | 7.9 | | 7.6 | | 7.4 | | 7.1 | | 7.6 | | 6.9 | | 8.0 | | 8.4 | | 8.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 2.0 | |
| **Pesticide/PCB Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| alpha-BHC | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 67 | J | 2.2 | U | 0.87 | J |
| beta-BHC | 2.0 | U | 610 | J | 2.4 | U | 3.5 | U | 2.3 | U | 12 | J | 14 | J | 4.2 | R | 2.4 | J | 18 | |
| delta-BHC | 2.0 | U | 190 | J | 2.4 | U | 4.6 | J | 2.3 | U | 2.1 | U | 2.1 | U | 4.2 | R | 2.2 | U | 3.5 | U |
| gamma-BHC (Lindane) | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 4.2 | R | 0.77 | J | 3.1 | J |
| Heptachlor | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 140 | J | 2.2 | U | 3.5 | U |
| Aldrin | 2.0 | U | 100 | J | 2.4 | U | 3.5 | U | 2.3 | U | 3.8 | J | 4.6 | J | 20 | J | 1.2 | J | 15 | J |
| Heptachlor epoxide | 2.0 | U | 2.4 | U | 2.4 | U | 1.7 | J | 2.3 | U | 6.1 | J | 11 | J | 20 | J | 2.2 | U | 29 | J |
| Endosulfan I | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U | 2.1 | U | 2.1 | U | 8.0 | J | 2.2 | U | 3.5 | U |
| Dieldrin | 3.9 | U | 15 | J | 4.7 | U | 36 | J | 4.5 | U | 12 | J | 17 | J | 40 | J | 4.2 | U | 58 | J |
| 4,4'-DDE | 3.9 | U | 4.7 | U | 4.7 | U | 6.5 | J | 4.5 | U | 4.0 | U | 4.1 | U | 69 | J | 4.2 | U | 130 | J |
| Endrin | 3.9 | U | 23 | J | 4.7 | U | 5.2 | J | 4.5 | U | 23 | J | 12 | J | 50 | J | 3.5 | J | 110 | J |
| Endosulfan II | 3.9 | U | 6.8 | J | 4.7 | U | 4.0 | J | 4.5 | U | 4.0 | U | 4.1 | U | 8.1 | R | 4.2 | U | 6.9 | U |
| 4,4'-DDD | 3.9 | U | 19 | J | 4.7 | U | 6.9 | U | 4.5 | U | 10 | J | 14 | J | 17 | J | 1.6 | J | 13 | J |
| Endosulfan sulfate | 3.9 | U | 4.7 | U | 4.7 | U | 6.9 | U | 4.5 | U | 13 | J | 18 | J | 8.1 | R | 4.2 | U | 66 | J |
| 4,4'-DDT | 3.9 | U | 20 | J | 4.7 | U | 6.9 | U | 4.5 | U | 34 | J | 47 | J | 42 | J | 4.2 | U | 6.9 | U |
| Methoxychlor | 20 | U | 24 | U | 24 | U | 35 | U | 23 | U | 21 | U | 21 | U | 41 | R | 22 | U | 35 | U |
| Endrin ketone | 3.9 | U | 9.8 | J | 4.7 | U | 140 | J | 4.5 | U | 6.2 | J | 9.6 | J | 46 | J | 4.2 | U | 150 | J |
| Endrin aldehyde | 3.9 | U | 4.7 | U | 4.7 | U | 86 | J | 4.5 | U | 22 | J | 32 | J | 8.1 | R | 1.8 | J | 52 | J |
| alpha-Chlordane | 2.0 | U | 59 | J | 2.4 | U | 40 | J | 2.3 | U | 6.0 | J | 9.7 | J | 4.2 | R | 2.2 | U | 150 | J |
| gamma-Chlordane | 2.0 | U | 41 | J | 2.4 | U | 1.8 | J | 2.3 | U | 6.2 | J | 9.9 | J | 28 | J | 2.2 | U | 520 | |
| Toxaphene | 200 | U | 240 | U | 240 | U | 350 | U | 230 | U | 210 | U | 210 | U | 410 | R | 220 | U | 350 | U |
| Aroclor-1016 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1221 | 80 | U | 94 | U | 94 | U | 140 | U | 91 | U | 82 | U | 83 | U | 160 | R | 86 | U | 140 | U |
| Aroclor-1232 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1242 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1248 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1254 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1260 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 7

**Analytical Results (Qualified Data)** 

Page 3

Case #: 28678 — SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | |
| pH : | 7.0 | | 7.7 | | 7.5 | | 7.9 | | 6.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| | | | | | | | | | Background | |
| **Pesticide/PCB Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| alpha-BHC | 2.3 | U | 2.2 | J | 1.8 | U | 2.0 | U | 2.2 | U |
| beta-BHC | 2.3 | U | 2.3 | U | 1.8 | U | 1.6 | J | 2.2 | U |
| delta-BHC | 2.3 | U | 2.0 | J | 1.8 | U | 2.0 | U | 2.2 | U |
| gamma-BHC (Lindane) | 2.3 | U | 4.0 | J | 1.8 | U | 2.0 | U | 2.2 | U |
| Heptachlor | 2.3 | U | 2.3 | U | 1.8 | U | 2.0 | U | 2.2 | U |
| Aldrin | 2.3 | U | 1.0 | J | 1.8 | U | 2.0 | U | 2.2 | U |
| Heptachlor epoxide | 2.3 | U | 2.3 | U | 1.8 | U | 2.0 | U | 2.2 | U |
| Endosulfan I | 2.3 | U | 2.3 | U | 1.8 | U | 0.52 | J | 2.2 | U |
| Dieldrin | 4.5 | U | 1.5 | J | 3.5 | U | 19 | J | 4.2 | U |
| 4,4'-DDE | 4.5 | U | 4.4 | U | 3.5 | U | 3.9 | U | 4.2 | U |
| Endrin | 4.5 | U | 4.0 | J | 3.5 | U | 3.9 | U | 4.2 | U |
| Endosulfan II | 4.5 | U | 4.4 | U | 3.5 | U | 3.9 | U | 4.2 | U |
| 4,4'-DDD | 4.5 | U | 1.8 | J | 3.5 | U | 3.9 | U | 4.2 | U |
| Endosulfan sulfate | 4.5 | U | 4.4 | U | 3.5 | U | 25 | J | 4.2 | U |
| 4,4'-DDT | 4.5 | U | 3.8 | J | 3.5 | U | 3.9 | U | 4.2 | U |
| Methoxychlor | 23 | U | 15 | J | 18 | U | 51 | J | 22 | U |
| Endrin ketone | 4.5 | U | 3.6 | J | 3.5 | U | 84 | J | 4.2 | U |
| Endrin aldehyde | 4.5 | U | 1.7 | J | 3.5 | U | 10 | J | 4.2 | U |
| alpha-Chlordane | 2.3 | U | 1.6 | J | 1.8 | U | 2.0 | U | 2.2 | U |
| gamma-Chlordane | 2.3 | U | 1.5 | J | 1.8 | U | 2.0 | U | 2.2 | U |
| Toxaphene | 230 | U | 230 | U | 180 | U | 200 | U | 220 | U |
| Aroclor-1016 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U |
| Aroclor-1221 | 92 | U | 89 | U | 71 | U | 79 | U | 86 | U |
| Aroclor-1232 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U |
| Aroclor-1242 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U |
| Aroclor-1248 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U |
| Aroclor-1254 | 45 | U | 44 | U | 35 | U | 1600 | J | 42 | U |
| Aroclor-1260 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U |

| Sample Number : | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 21 | | 24 | | 39 | | 26 | | 26 | |
| pH : | 7.2 | | 7.7 | | 8.0 | | 8.5 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Pesticide/PCB Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| alpha-BHC | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| beta-BHC | 2.2 | U | 2.2 | U | 2.8 | UJ | 0.93 | J | 2.3 | U |
| delta-BHC | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| gamma-BHC (Lindane) | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Heptachlor | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Aldrin | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Heptachlor epoxide | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Endosulfan I | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Dieldrin | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDE | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endrin | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endosulfan II | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDD | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endosulfan sulfate | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDT | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Methoxychlor | 22 | U | 22 | U | 28 | UJ | 23 | U | 23 | U |
| Endrin ketone | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endrin aldehyde | 4.2 | U | 4.3 | U | 5.4 | UJ | 1.7 | J | 4.5 | U |
| alpha-Chlordane | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| gamma-Chlordane | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Toxaphene | 220 | U | 220 | U | 280 | UJ | 230 | U | 230 | U |
| Aroclor-1016 | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1221 | 85 | U | 88 | U | 110 | UJ | 91 | U | 91 | U |
| Aroclor-1232 | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1242 | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1248 | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1254 | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1260 | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

# CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

## KEY SAMPLES
## TABLE 8



| | |
|---|---|
| nalytical Results (Qualified Data) | |
| se #: 28678 | SDG : MEE01B |
| e : | CLARK OIL |
| b. : | LIBRTY |
| viewer : | J. GANZ |
| te : | DECEMBER 12, 2000 |

| ample Number : | MEE01B | | MEE01C | | MEE01D | | MEE01E | | MEE01F | | MEE01G | | MEE01H | | MEE01J | | MEE01K | | MEE01L | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ampling Location : | X101 | | X102 | | X103 | | X104 | | X105 | | X106 | | X107 | | X108 | | X109 | | X110 | |
| atrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| nits : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| ate Sampled : | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/1/00 | | 11/2/00 | | 11/2/00 | |
| me Sampled : | 11:30 | | 11:30 | | 12:50 | | 13:10 | | 15:00 | | 15:20 | | 16:00 | | 16:45 | | 08:15 | | 09:25 | |
| Solids : | 99.1 | | 66.9 | | 84.4 | | 77.2 | | 73.4 | | 76.6 | | 81.1 | | 75.9 | | 74.4 | | 83.2 | |
| ilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **ANALYTE** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| LUMINUM | 192 | | 12200 | | 9410 | | 4020 | | 12700 | | 9280 | | 7860 | | 8660 | | 12600 | | 9740 | |
| NTIMONY | 0.44 | UJ | 0.65 | UJ | 1.6 | J | 0.59 | UJ | 0.62 | UJ | 0.56 | UJ | 0.57 | J | 0.96 | J | 0.68 | J | 0.78 | J |
| RSENIC | 0.65 | UJ | 8.0 | J | 9.3 | J | 1.8 | J | 5.8 | J | 4.2 | J | 7.5 | J | 7.8 | J | 5.9 | J | 8.4 | J |
| ARIUM | 5.3 | | 164 | | 300 | | 235 | | 213 | | 269 | | 157 | | 184 | | 157 | | 276 | |
| ERYLLIUM | 0.038 | U | 1.0 | | 0.96 | | 0.28 | J | 0.81 | | 0.72 | | 0.60 | | 0.60 | | 0.83 | | 0.72 | |
| ADMIUM | 0.057 | U | 0.31 | J | 0.70 | | 0.077 | U | 0.081 | U | 0.20 | J | 0.45 | J | 0.078 | U | 0.075 | U | 0.097 | J |
| ALCIUM | 1810 | J | 7260 | J | 51700 | J | 18600 | J | 5410 | J | 4480 | J | 3610 | J | 4520 | J | 4940 | J | 6280 | J |
| HROMIUM | 1.8 | J | 17.5 | J | 190 | J | 7.6 | J | 14.3 | J | 14.8 | J | 12.4 | J | 14.7 | J | 14.8 | J | 15.1 | J |
| OBALT | 0.20 | | 7.3 | | 6.1 | | 5.4 | | 8.7 | | 7.4 | | 9.7 | | 8.8 | | 13.5 | | 6.2 | |
| OPPER | 4.2 | | 36.0 | | 73.9 | | 10.1 | | 23.1 | | 22.0 | | 22.9 | | 22.3 | | 22.3 | | 179 | |
| ON | 447 | | 16200 | | 31400 | | 8320 | | 18300 | | 13900 | | 17200 | | 19800 | | 17500 | | 14400 | |
| EAD | 2.7 | J | 21.7 | J | 111 | J | 7.5 | J | 13.5 | J | 23.8 | J | 15.5 | J | 13.1 | J | 17.9 | J | 375 | J |
| AGNESIUM | 209 | | 3960 | | 6930 | | 6890 | | 3170 | | 2600 | | 3150 | | 3920 | | 3280 | | 2850 | |
| ANGANESE | 49.7 | J | 334 | J | 2110 | J | 271 | J | 646 | J | 481 | J | 699 | J | 167 | J | 615 | J | 429 | J |
| ERCURY | 0.058 | J | 0.21 | J | 0.13 | J | 0.088 | J | 0.10 | J | 0.097 | J | 0.070 | J | 0.091 | J | 0.090 | J | 0.14 | J |
| CKEL | 1.6 | J | 21.8 | J | 70.4 | J | 14.7 | J | 20.5 | J | 16.1 | J | 31.1 | J | 27.6 | J | 20.4 | J | 16.6 | J |
| OTASSIUM | 44.2 | | 1950 | | 1680 | | 1100 | | 1130 | | 1480 | | 930 | | 935 | | 1130 | | 1280 | |
| ELENIUM | 0.82 | UJ | 1.2 | J | 0.99 | UJ | 1.1 | UJ | 1.2 | UJ | 1.0 | UJ | 0.98 | UJ | 2.1 | J | 1.1 | UJ | 1.7 | J |
| LVER | 0.078 | U | 0.11 | U | 0.33 | | 0.10 | U | 0.11 | U | 0.098 | U | 0.091 | U | 0.10 | U | 0.10 | U | 0.094 | U |
| ODIUM | 115 | J | 553 | J | 479 | J | 269 | J | 232 | J | 260 | J | 209 | J | 253 | J | 283 | J | 346 | J |
| HALLIUM | 1.1 | UJ | 9.3 | J | 12.9 | J | 4.3 | J | 9.7 | J | 8.6 | J | 11.2 | J | 13.4 | J | 9.7 | J | 8.1 | J |
| ANADIUM | 7.0 | | 29.1 | | 57.2 | | 14.9 | | 21.8 | | 27.3 | | 25.1 | | 27.4 | | 25.1 | | 26.2 | |
| NC | 6.4 | J | 83.7 | J | 580 | J | 35.2 | J | 58.8 | J | 64.4 | J | 55.1 | J | 59.2 | J | 57.8 | J | 66.8 | J |
| YANIDE | 0.045 | U | 0.11 | J | 0.23 | J | 0.056 | U | 0.060 | J | 0.057 | U | 0.076 | J | 0.058 | U | 0.10 | J | 0.12 | J |

hlighted entries are at least three times background, some will be ten times background if background level is estimated,

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 8

| Analytical Results (Qualified Data) | | Page 2 |
|---|---|---|
| Case #: 28678 | SDG : MEE01B | |
| Site : | CLARK OIL | |
| Lab. : | LIBRTY | |
| Reviewer : | J. GANZ | |
| Date : | DECEMBER 12, 2000 | |

| Sample Number : | MEE01M | | MEE01N | | MEE01P | | MEE01Q | | MEE01R | | MEE01S | | MEE01T | | MEE01W | | MEE01X | | MEE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| Date Sampled : | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Solids : | 81.3 | | 62.4 | | 74.2 | | 80.2 | | 73.9 | | 79.4 | | 78.4 | | 78.5 | | 75.1 | | 76.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| ANALYTE | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| ALUMINUM | 6840 | | 852 | | 11800 | | 193 | | 15100 | | 9460 | | 24600 | | 448 | | 11000 | | 8240 | |
| ANTIMONY | 0.53 | UJ | 26.5 | J | 0.71 | J | 0.57 | UJ | 0.65 | J | 0.64 | J | 1.2 | J | 0.83 | J | 0.57 | UJ | 1.0 | J |
| ARSENIC | 5.9 | J | 2.4 | J | 3.7 | J | 1.0 | J | 5.2 | J | 5.4 | J | 14.2 | J | 2.0 | J | 6.1 | J | 9.1 | J |
| BARIUM | 164 | | 34.4 | | 842 | | 66.0 | | 247 | | 238 | | 197 | | 14.6 | | 317 | | 155 | |
| BERYLLIUM | 0.43 | | 0.10 | J | 0.77 | | 0.049 | U | 1.0 | | 0.64 | | 0.76 | | 0.049 | U | 0.63 | | 0.46 | |
| CADMIUM | 0.070 | U | 26.8 | | 0.17 | J | 0.074 | U | 0.080 | U | 0.10 | J | 0.076 | U | 0.074 | U | 0.074 | U | 0.079 | U |
| CALCIUM | 2950 | J | 11100 | J | 4120 | J | 3150 | J | 5580 | J | 23300 | J | 17600 | J | 7600 | J | 3680 | J | 15900 | J |
| CHROMIUM | 11.3 | J | 196 | J | 14.1 | J | 5.0 | J | 16.6 | J | 126 | J | 127 | J | 24.2 | J | 16.7 | J | 76.6 | J |
| COBALT | 6.1 | | 2.8 | | 37.0 | | 0.96 | | 9.0 | | 9.1 | | 8.9 | | 1.8 | | 6.5 | | 32.0 | |
| COPPER | 14.7 | | 333 | | 21.8 | | 12.4 | | 26.0 | | 28.1 | | 39.9 | | 18.1 | | 19.8 | | 57.5 | |
| IRON | 13500 | | 4670 | | 13900 | | 1430 | | 20300 | | 16000 | | 16800 | | 26500 | | 17800 | | 19800 | |
| LEAD | 9.0 | J | 172 | J | 17.6 | J | 22.2 | J | 12.6 | J | 39.3 | J | 86.8 | J | 7.7 | J | 13.4 | J | 84.1 | J |
| MAGNESIUM | 2920 | | 2410 | | 3420 | | 868 | | 3830 | | 3900 | | 6100 | | 875 | | 3720 | | 3160 | |
| MANGANESE | 229 | J | 74.3 | J | 3900 | J | 22.7 | J | 599 | J | 583 | J | 544 | J | 113 | J | 436 | J | 316 | J |
| MERCURY | 0.098 | J | 0.37 | J | 0.073 | J | 0.081 | J | 0.069 | J | 0.11 | J | 0.13 | J | 0.092 | J | 0.11 | J | 0.21 | J |
| NICKEL | 18.8 | J | 70.2 | J | 29.9 | J | 3.1 | J | 21.9 | J | 24.7 | J | 26.4 | J | 24.9 | J | 20.8 | J | 65.4 | J |
| POTASSIUM | 764 | | 120 | | 993 | | 42.2 | | 1290 | | 1180 | | 1490 | | 95.5 | | 1250 | | 874 | |
| SELENIUM | 1.0 | UJ | 3.0 | J | 1.1 | UJ | 1.1 | UJ | 1.2 | UJ | 2.6 | J | 1.5 | J | 9.6 | J | 1.1 | UJ | 1.7 | J |
| SILVER | 0.093 | U | 1.0 | | 0.11 | U | 0.18 | | 0.11 | U | 0.099 | U | 0.10 | U | 0.15 | | 0.099 | U | 0.10 | U |
| SODIUM | 262 | J | 298 | J | 1040 | J | 224 | J | 260 | J | 268 | J | 349 | J | 246 | J | 328 | J | 494 | J |
| THALLIUM | 7.8 | J | 3.1 | J | 7.0 | J | 1.4 | UJ | 9.9 | J | 7.7 | J | 7.1 | J | 14.9 | J | 10.3 | J | 11.6 | J |
| VANADIUM | 19.2 | | 403 | | 23.4 | | 5.3 | | 29.5 | | 63.6 | | 70.1 | | 334 | | 27.5 | | 53.5 | |
| ZINC | 44.2 | J | 2480 | J | 44.5 | J | 39.1 | J | 55.0 | J | 139 | J | 217 | J | 33.8 | J | 62.2 | J | 95.9 | J |
| CYANIDE | 0.055 | U | 0.64 | | 0.082 | J | 0.49 | | 0.076 | J | 0.39 | J | 0.41 | J | 2.8 | | 0.059 | U | 3.5 | |

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

KEY SAMPLES
TABLE 8

nalytical Results (Qualified Data) — Page 3

| | |
|---|---|
| se #: 28678 | SDG : MEE01B |
| e : | CLARK OIL |
| o. : | LIBRTY |
| viewer : | J. GANZ |
| te : | DECEMBER 12, 2000 |

| | MEE01Z | | MEE020 | | MEE021 | | MEE022 | | MEE025 | |
|---|---|---|---|---|---|---|---|---|---|---|
| mple Number : | MEE01Z | | MEE020 | | MEE021 | | MEE022 | | MEE025 | |
| mpling Location : | X121 | | X122 | | X123 | | X124 | | X125 | |
| atrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| its : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| ate Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | |
| me Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | |
| Solids : | 88.0 | | 83.2 | | 95.2 | | 74.8 | | 76.2 | |
| lution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| | | | | | | | | | Background | |
| ANALYTE | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| UMINUM | 3950 | | 5200 | | 1630 | | 5620 | | 11400 | |
| ITIMONY | 0.52 | UJ | 0.53 | UJ | 0.45 | UJ | 0.58 | UJ | 0.61 | J |
| SENIC | 0.77 | U | 0.78 | U | 0.66 | U | 4.0 | J | 3.3 | |
| RIUM | 40.6 | | 56.5 | | 26.6 | | 125 | | 171 | |
| RYLLIUM | 0.17 | J | 0.24 | J | 0.090 | J | 0.59 | | 0.83 | |
| DMIUM | 0.070 | U | 0.070 | U | 0.060 | U | 0.43 | J | 0.080 | U |
| LCIUM | 879 | | 2320 | | 556 | | 149000 | | 4230 | |
| IROMIUM | 6.9 | | 9.3 | | 5.7 | | 47.1 | | 15.8 | |
| BALT | 2.9 | | 3.6 | | 3.0 | | 7.1 | | 5.6 | |
| PPER | 7.3 | | 9.9 | | 4.0 | | 45.1 | | 20.1 | |
| ON | 4690 | | 7740 | | 3480 | | 12500 | | 16400 | |
| AD | 4.3 | | 7.4 | | 2.7 | | 73.7 | | 20.6 | |
| GNESIUM | 972 | | 1400 | | 633 | | 7220 | | 2630 | |
| NGANESE | 30.6 | | 228 | | 34.9 | | 418 | | 372 | |
| RCURY | 0.090 | J | 0.10 | J | 0.070 | J | 0.16 | J | 0.10 | J |
| CKEL | 7.9 | | 10.8 | | 8.1 | | 19.8 | | 14.9 | J |
| TASSIUM | 372 | | 643 | | 140 | | 1180 | | 1090 | J |
| LENIUM | 0.98 | UJ | 0.98 | UJ | 0.84 | UJ | 1.1 | UJ | 1.5 | J |
| VER | 0.080 | U | 0.090 | U | 0.080 | U | 0.10 | U | 0.10 | U |
| DIUM | 207 | J | 344 | J | 167 | J | 353 | J | 195 | J |
| ALLIUM | 3.3 | J | 5.3 | | 2.0 | J | 3.0 | J | 11.7 | |
| NADIUM | 12.2 | | 12.0 | | 10.4 | | 25.2 | | 25.6 | |
| IC | 16.3 | | 27.6 | | 10.2 | | 427 | | 66.7 | |
| ANIDE | 0.050 | U | 0.050 | U | 0.050 | U | 0.060 | U | - | |

| | MEE026 | | MEE027 | | MEE028 | | MEE029 | | MEE02A | |
|---|---|---|---|---|---|---|---|---|---|---|
| mple Number : | MEE026 | | MEE027 | | MEE028 | | MEE029 | | MEE02A | |
| mpling Location : | X126 | | X127 | | X128 | | X129 | | X130 | |
| atrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| its : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| ate Sampled : | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| me Sampled : | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| Solids : | 83.8 | | 75.6 | | 70.8 | | 76.9 | | 74.1 | |
| lution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| ANALYTE | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| UMINUM | 4280 | | 14400 | | 14100 | | 14700 | | 6860 | |
| ITIMONY | 0.51 | R | 0.64 | J | 0.65 | R | 0.60 | R | 0.65 | J |
| SENIC | 0.75 | U | 7.4 | | 7.8 | | 5.3 | | 5.0 | |
| RIUM | 50.1 | | 187 | | 322 | | 256 | | 161 | |
| RYLLIUM | 0.35 | J | 0.93 | | 1.0 | | 0.87 | | 0.51 | J |
| DMIUM | 0.070 | U | 0.16 | J | 0.15 | J | 0.080 | U | 0.080 | U |
| LCIUM | 1560 | | 11300 | | 9900 | | 7750 | | 23900 | |
| IROMIUM | 7.8 | | 86.0 | | 18.1 | | 17.3 | | 11.4 | |
| BALT | 3.8 | | 9.1 | | 8.6 | | 8.1 | | 8.4 | |
| PPER | 8.1 | | 25.2 | | 26.9 | | 25.4 | | 16.3 | |
| ON | 7740 | | 23300 | | 21900 | | 19900 | | 17300 | |
| AD | 5.9 | | 45.2 | | 18.7 | | 21.5 | | 13.8 | |
| GNESIUM | 1470 | | 3860 | | 5190 | | 4130 | | 8360 | |
| NGANESE | 48.4 | | 825 | | 473 | | 601 | | 516 | |
| RCURY | 0.050 | J | 0.18 | J | 0.10 | J | 0.070 | J | 0.090 | J |
| CKEL | 9.9 | J | 22.3 | J | 23.3 | J | 21.7 | J | 21.6 | J |
| TASSIUM | 422 | J | 1420 | J | 2370 | J | 1470 | J | 1320 | J |
| LENIUM | 1.6 | J | 1.8 | J | 1.2 | UJ | 1.1 | UJ | 1.2 | UJ |
| VER | 0.090 | U | 0.10 | U | 0.11 | U | 0.10 | U | 0.11 | U |
| DIUM | 206 | J | 346 | J | 354 | J | 377 | J | 443 | J |
| ALLIUM | 5.0 | J | 15.4 | | 13.3 | | 13.2 | | 9.9 | |
| NADIUM | 13.3 | | 34.9 | | 34.7 | | 30.5 | | 21.7 | |
| IC | 25.1 | | 92.4 | | 70.5 | | 62.1 | | 48.3 | |
| ANIDE | - | | - | | - | | - | | - | |

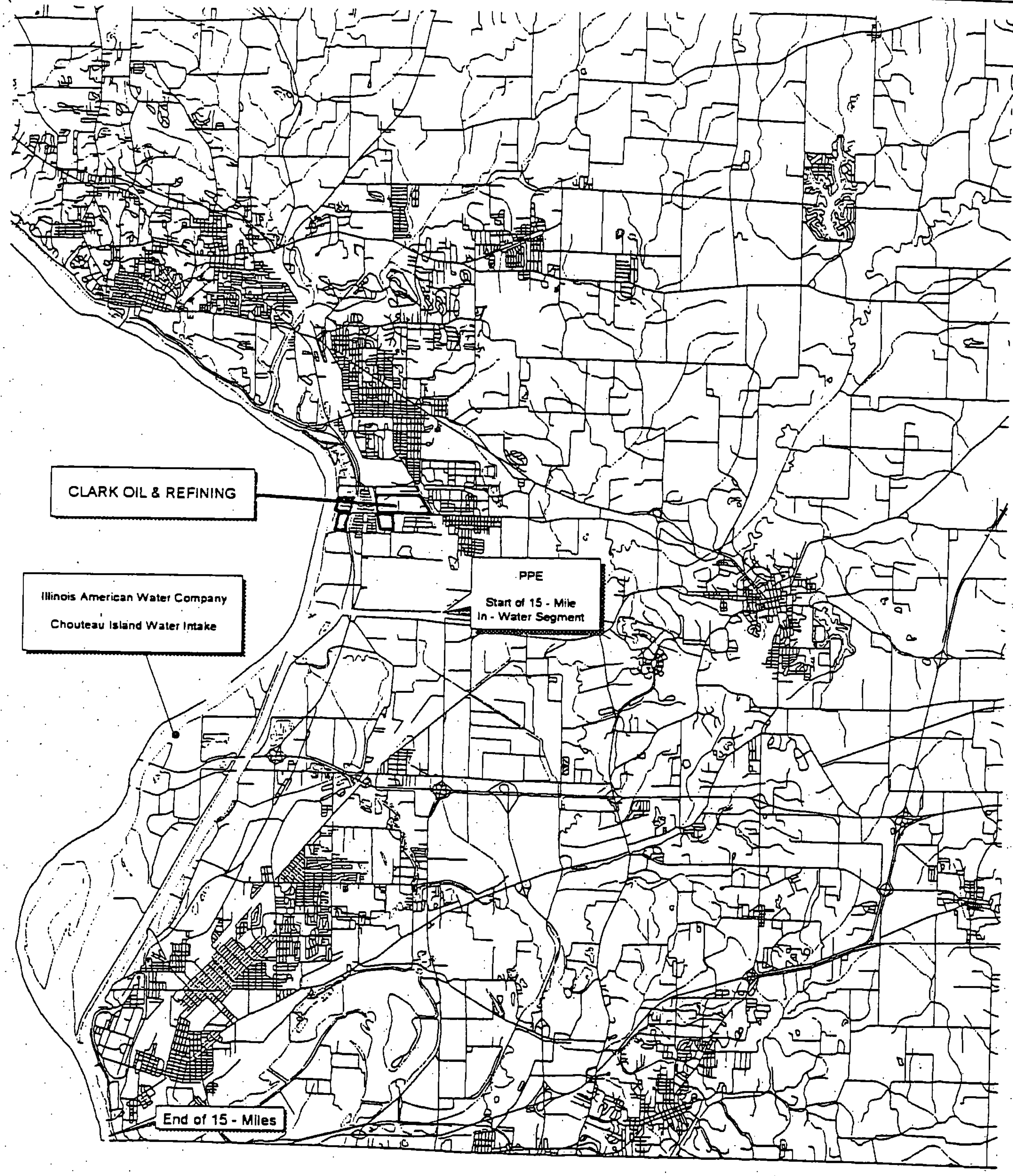
- No results reported from Laboratory.
hlighted entries are at least three times background, some will be ten times background if background level is estimated.

# CLARK OIL & REFINING COMPANY
## SAMPLE DESCRIPTIONS
Table 9

| SAMPLE | DEPTH | APPEARANCE | TVA READINGS (units) PID | FID | LOCATION |
|---|---|---|---|---|---|
| X101 | 0.0' - 0.5' | Tar like substance. | 9 | 25 | Hawthorne St. west of levee just south of old waste water lagoon #1. |
| X102 | 9' - 11' | Med. tan silty clay, hydrcarbon odor. | 8 | 44 | Deep sample in above location. |
| X103 | 1' - 3' | Lt. tan, sandy, silty loam w/ gravel | 1 | 3 | Center of old Clark Oil dump, now used by Hartford for dirt, rock, concrete, etc. |
| X104 | 13' - 15' | Med. grey, clayey, silt. | 12.5 | 51 | Deep sample in above location. |
| X105 | 1' - 2.5' | Cinders at top, then black clay w/ some silt. | 3.5 | 22 | North of former TEL building |
| X106 | 9' - 11' | Dk. grey-green grey silt w/ v. f. sand. | 92 | 900 | Deep sample in above location. |
| X107 | 1' - 2.5' | Dk. grey - black, silty clay | 20 | 1400 | Within bermed containment area of tank 35-1 & 35-2. |
| X108 | 4' - 6' | Med. grey silty clay | 11 | 315 | Within bermed containment area of tank 162 (formerly 10-2). |
| X109 | 1' - 3' | Dk. brown-Dk. grey silty clay | 4 Ambient air in bore hole | 570 | Near NE corner of south tank farm south of Hawthorne St. |
| X110 | 1' - 3' | Med.-Dk. grey clay. | 42 | 50 | North of drum accumulation/storage area in central portion of site. |
| X111 | 9' - 11' | Grey green silt w/clay. | 20 | 150 | Deep sample in above location. |
| X112 | 0.5' - 1' | Black stained, oily, silty clay. | 17 | 7 | Outside of SW corner of concrete containment wall of tank Tl-18. |
| X113 | 1' - 3' | Med. grey clay w/ some silt. | 12 | 2 | NE corner of bermed containment area of tank 120-2. |
| X114 | 0.0' - 0.5' | Leaded Tank Bottom material Black, stiff, slightly oily. | NA | NA | SE corner of leaded tank bottom pit. |
| X115 | 6' - 8' | Med. grey-greenish grey silt. | 40 | 12 | South of leaded tank bottom pit. |

# CLARK OIL & REFINING COMPANY
## SAMPLE DESCRIPTIONS (cont.)
Table 9

| SAMPLE | DEPTH | APPEARANCE | TVA READINGS (units) PID | FID | LOCATION |
|---|---|---|---|---|---|
| X116/X117 (Dup of X116) | 0.0' - 0.5' | Med.-Dk. brown silty, sandy clay. | NA | NA | In drainage accumulation ditch SE of old (short) flare stack. |
| X118 | 1' - 3' | Black fines of petroleum coke. | 19 | NA | SW corner of unused area east of coking area. |
| X119 | 8' - 10' | Med. grey clay mixed w/ yellow brown clay. | 46 | NA | Deep sample in above location. |
| X120 | 1' - 4' | Fill & gravel to 3', then black silty clay. | 39 | NA | Just west of NW corner of Guard Basin in SE corner of site. |
| X121 | 14' - 16' | Olive brown clay to 14.5', then grey brown, med.-fine, sand w/ silt. | 18 | NA | Deep sample in above location. |
| X122 | 8' - 10' | Tan sand at top, then olive brown clay. | NA | NA | NE corner of site. |
| X123 | 18' - 20' | Med.-course brown sand. | NA | NA | Deep sample in above location. |
| X124 | 0.0' - 0.5' | Med. brown, sandy, silty loam. very fine silty sand. Moist. | NA | NA | Adjacent to NE corner of old API separator north of guard basin. |
| X125 | 1' - 3' | Med.-Dk. brown, silty, clay | NA<br>Too wet & humid for TVA | NA | East of Roxana Water treatment Bldg. east of Route 111. |
| X126 | 13' - 15' | Fine sandy silt from 12' - 14.5', then med.-course tan sand. | NA | NA | Deep sample in above location. |
| X127 | 2' - 4' | Dk. brown-Dk. grey clay. | NA<br>Too wet & humid for TVA | NA | West of levee, west of old waste water lagoon #2, north of Hawthorne St. |
| X128 | 14.5' - 16' | Dk. grey clay, petroleum odor & stain. | NA | NA | Deep sample in above location. |
| X129 | 2' - 4' | Gravel from 0.0'-3.0', then Dk. brown-Dk. grey clay. | NA<br>Too wet & humid for TVA | NA | Immediately west of Bio-unit/API separator, west side of site. |
| X130 | 14' - 16' | Dk. grey-black,silty clay, petroleum odor and stains. | NA | NA | Deep sample in above location |




# 15 - MILE

# SURFACE WATER MAP

# APPENDIX P-14

## HARTFORD REFINERY TRIANGLE SURFACE IMPOUNDMENT

01-3089

Source: IEPA BOL

Premcor

Premier People.
Products and Services

The Premcor Refining Group
Hartford Refinery
201 East Hawthorne
Hartford, Illinois 62048-0007
618-254-7301
618-254-6064 fax

1190500002
Premcor Refining Gro
SR/TECH

August 10, 2001

Illinois Environmental Protection Agency
Bureau of Land
Remediation Project Management Section
Site Remediation Program
1021 North Grand Avenue East
PO Box 19276
Springfield, IL 62794-9276

ORIGINAL

Re: April 10, 2001 IEPA Site Inspection by Mr. Chris Cahnovsky

To Whom It May Concern:

Please find enclosed the Site Remediation Program Application and Service Agreement (FORM DRM-1) for The Premcor Refining Group, Inc., Hartford Refinery Triangle Surface Impoundment. This package is in response to the discussion between the Premcor Refining Group, Inc. and the IEPA.

Please call me at 618-254-7301, Ext. 218 regarding this application.

Sincerely,

M. Modarres

Massood Modarres
Environmental Engineer

RELEASABLE
AUG 2 0 2001
REVIEWER MM

cc: Mr. Chris Cahnovsky, IEPA
File

RECEIVED
AUG 1 6 2001
IEPA/BOL

K:\massood\corres\site remediation application081001.doc 08/09/01 1:45 PM

Illinois Environmental Protection Agency
Bureau of Land
Remedial Project Management Section
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

**FOR ILLINOIS EPA USE:**
LOG NO. ______________

☐ $500 Advance Partial Payment Included
☐ DRM-2 SRP Form Included
☐ DRM-3 Request for Assessment Included
☐ DRM-4 Tax Credit Budget Plan Included

RECEIVED
AUG 1 6 2001
IEPA/BOL

## Site Remediation Program Application and Services Agreement (DRM- 1) Form

## I. Site Identification:

Site Name: The Premcor Refining Group,Inc. Hartford Refinery Triangle Surface Impoundment
Street Address: 201 East Hawthorne
City: Hartford ZIP Code: 62048
County: Madison Approximate Size of Site (Acres): 0.25
Illinois Inventory I. D. Number: ILD041889023 U.S. EPA I.D. Number : 1190500002
Site Base Map Attached ☑ Illinois EPA Permit(s): ______________
LUST/IEMA Incident Number(s), if applicable: NA

## II. Remediation Applicant ("RA"):

RA's Name: Craig M. Kramer Title: Refinery Manager
Company: The Premcor Refining Group, Inc.
Street Address: 201 East Hawthorne
City: Hartford State: IL ZIP Code: 62048
Phone: (618) 254-7301 FEIN or SSN: 282-50-4441

I hereby certify that I am authorized to sign this application and services agreement. I certify that the proposed project meets the eligibility criteria set forth in Section 58.1(a)(2) of the Environmental Protection Act (415 ILCS 5/58.1(a)(2)) and regulations promulgated thereunder and that this submittal and all attachments were prepared at my direction. In consideration for the Illinois EPA's agreement to provide (subject to applicable law, available resources, and receipt of the advance partial payment) review and evaluation services for activities carried out pursuant to Title 17 of the Illinois Environmental Protection Act (415 ILCS 5/58-58.12), I agree to:

(1) Conform with the procedures of Title 17 of the Illinois Environmental Protection Act (415 ILCS 5/58 - 58.12) and implementing regulations;
(2) Allow for or otherwise arrange site visits or other site evaluations by the Illinois EPA when requested;
(3) Pay any reasonable costs incurred and documented by the Illinois EPA in providing such services*; and
(4) Make an advance partial payment to the Illinois EPA for such anticipated services provided in Section V of this application.

As the Remediation Applicant, I understand that I may terminate this services agreement at any time, by notifying the Illinois EPA in writing that services previously requested under the services agreement are no longer wanted. Within 180 days after receipt of the notice, the Illinois EPA shall provide me with a final invoice for services provided until the date of receipt of such notification.

To the best of my knowledge and belief, this request and all attachments are true, accurate and complete. I hereby certify that I have the authority to enter into this agreement.

RA's Signature: CMKramer Date: August 10.2001

***In addition to the fees applicable under this Services Agreement, the recipient of a No Further Remediation Letter must pay to the Illinois EPA a No Further Remediation Assessment in the amount of the lesser of $2500 or an amount equal to the costs incurred by the Illinois EPA under this Agreement (35 IAC 740.615).**

## II. Project Objectives:

| | | |
|---|---|---|
| A. | Release Letter Requested. Please complete one of the subsections by checking applicable boxes and including other information (if necessary, additional information may be attached to this application form): | ☐ Comprehensive No Further Remediation ("NFR") Letter |
| | | ☑ Focused NFR Letter<br>Identify the focused contaminants of concern by checking the applicable box(es):<br>☑ Volatiles ☐ BTEX ☐ PCBs ☑ Metals<br>☑ Semivolatiles ☐ PNAs ☐ Pesticides<br>Other (identify): ______ |
| | | ☐ 4(y) Letter<br>Identify the focused contaminants of concern by checking the applicable box(es):<br>☐ Volatiles ☐ BTEX ☐ PCBs ☐ Metals<br>☐ Semivolatiles ☐ PNAs ☐ Pesticides<br>Other (identify): ______<br>Identify the media of concern by checking applicable boxes:<br>☐ Soil ☐ Sediments Other: ______<br>Identify the actions (e.g., drum removal, spill response, etc.): |
| B. | Identify any support services being sought from the Illinois EPA in addition to the review and evaluation services (if necessary, additional information may be attached to this application form): | ☑ No additional support services are being sought<br>☐ Assistance with community relations<br>☐ Environmental Remediation Tax Credit Budget Review (Attach DRM-4 application)<br>☐ Sample collection and analyses<br>☐ Other (identify): ______ |

**C. Anticipated Schedule**

| SRP Document | Projected Date of Receipt by Illinois EPA |
|---|---|
| Site Investigation Report | October 1,2001 |
| Remediation Objectives Report | October 1,2001 |
| Remedial Action Plan | October 1,2001 |
| Remedial Action Completion report | November 1,2001 |

**D. Identify the current and post-remediation uses of the remediation site (if necessary, additional information may be attached to this application form):**

Current Use:
**Petroleum Refinery**

Post-Remediation Use:
**Petroleum Refinery**

## IV. Written Permission from the Property Owner (check <u>one</u> of the applicable boxes and provide additional information):

☑ RA is the property owner of the remediation site identified in Section I of this application.

☐ RA is **not** the property owner of the remediation site identified in Section I of this application.

Property Owner's Name: ______________________

Title: ______________________

Company: ______________________

Street Address: ______________________

City: ______________ State: ______ ZIP Code: ______________ Phone: ______________

I hereby certify that the Remediation Applicant has my permission to enroll the site identified in Section I of this application into the Illinois EPA Site Remediation Program. I certify that the Remediation Applicant and designated representatives have permission to enter upon the indicated premises for the purpose of conducting remedial investigations or activities.

Owner's Signature: ______________________ Date: ______________

**For multiple property owners, attach additional sheets containing all the information above along with a signed, dated certification for each.**

## V. Advance Partial Payment:

The Remediation Applicant shall select <u>one</u> of the following advance partial payment plans:

☑ Plan 1: A $500 advance partial payment is included with this application. Please make the check payable to: "Illinois Environmental Protection Agency". Please include "For Deposit in the Hazardous Waste Fund" and the Remediation Applicant's FEIN or SSN on the check; or

☐ <u>Plan 2: Request that the Illinois EPA determine the appropriate partial payment (i.e., approximately one-half of the total anticipated costs of the Illinois EPA, not to exceed $5,000). A completed DRM-3 form ("Request for Assessment of Advance Partial Payment for Anticipated Services") must accompany this application so that the Illinois EPA may determine the appropriate advance partial payment specific to the services requested.</u>

NOTE: Illinois EPA cannot refund payments without a legislative appropriation. Payment under Plan 1 accelerates the review process but increases the risk of forfeiting the payment if the applicant is ineligible. Payment under Plan 2 may result in a larger advance partial payment when a final determination is made on the application, but it reduces the risk of forfeiture.

Λ **If this application contains plans and reports for review and evaluation by the Illinois EPA, a completed Form DRM-2 must also accompany this submittal.**

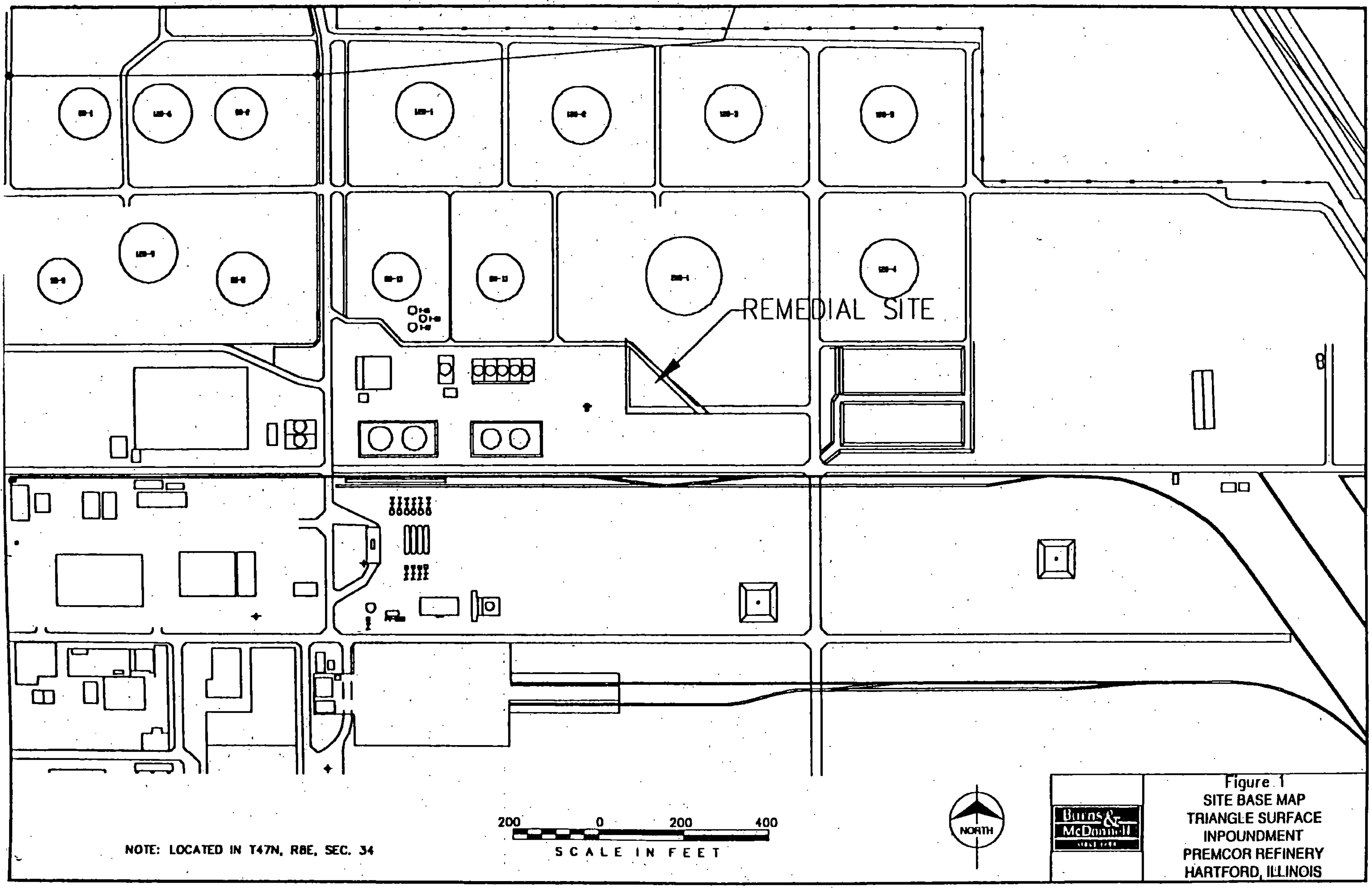



Figure 1
SITE BASE MAP
TRIANGLE SURFACE
INPOUNDMENT
PREMCOR REFINERY
HARTFORD, ILLINOIS

# Illinois Environmental Protection Agency

2009 Mall Street, Collinsville, Illinois 62234
Thomas V. Skinner, Director

618/346-5120
TDD 618/346-5155

July 25, 2001

The Premcor Refining Group
Attn: Bill R. Irwin, Environmental Supervisor
201 East Hawthorne
Hartford, Illinois 62048-0007

Re: 1190500002 – Madison County
Premcor Refining Group
ILD041889023
FOS File

Dear Mr. Irwin:

On April 10, 2001, an inspection of the above referenced site was conducted by a representative of the Illinois Environmental Protection Agency. The purpose of this inspection was to determine the site's compliance with the Illinois Environmental Protection Act and 35 Illinois Administrative Code 703, 721, 722, 724 and 728 regulations.

For your information, a copy of the inspection report is enclosed. Attached to this inspection report are the results of samples that were taken at your facility during this inspection. The letter "K" indicates that the constituent was not detected. The number preceding the "K" is the detection limit, or the level at which the instrument can detect the constituent.

Please contact me at 618/346-5120 if you have any questions regarding this inspection.

Sincerely,

Chris N. Cahnovsky

Chris N. Cahnovsky, Acting Regional Manager
Field Operations Section
Bureau of Land

FILE NUMBER 070.25.05

RETAIN IN FILE UNTIL ________

CNC:
Enclosure

# ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
## BUREAU OF LAND/FIELD OPERATIONS SECTION
## RCRA INSPECTION REPORT

## GENERAL FACILITY INFORMATION

USEPA ID #: ILD041889023 IEPA ID #: 1190500002

Facility Name: Premcor Refining Group, Inc. Phone #: 618/254-7301

Location: 201 East Hawthorne P.O. Box 7 County: Madison

City: Hartford State: Illinois Zip Code: 62048-0007

Region: Collinsville Inspection Date: April 10, 2001 Time: 10:00-12:00

Weather:

## TYPE OF FACILITY

Notified As: G-1 Regulated As: G-5/D

## TYPE OF INSPECTION

CEI: CME/O&M: CSI: X NRR: F/U to: / / CCI: PIF: CVI: CSE: CAO: Other:

## NOTIFICATION INFORMATION (EPA 8700-12)

Notification Date: 08/18/80 (initial) / / (subsequent)

## PART A PERMIT INFORMATION (EPA 3510-3)

Part A Date: 11/11/80 Amended: / / Withdrawn: 11/23/82

## PART B PERMIT INFORMATION

Part B Submitted/Issued (circle one): / /

## ACTIVE ENFORCEMENT

Has the company been referred to: USEPA: / / IAGO: / / County State's Attorney: / /

## ACTIVE ENFORCEMENT ORDERS

ACO: / / CAFO: / / Federal Court Order: / /

Consent Decree: / / IPCB Order: 11/18/96 State Court Order: / /

## TSD FACILITY ACTIVITY SUMMARY

| Activity by Process Code | On Part A? | On Part B? | Activity ever done? | Closed? | Being done during insp? | Exempt per 35 IAC Sec: | On Annual Report 1998 1999 2000 |
|---|---|---|---|---|---|---|---|
| D80 (2) | No | No | Yes | No | Yes | No | N / N / N |
| | | | | | | | / / |
| | | | | | | | / / |
| | | | | | | | / / |
| | | | | | | | / / |
| | | | | | | | / / |
| | | | | | | | / / |
| | | | | | | | / / |
| | | | | | | | / / |
| | | | | | | | / / |

| OWNER | | OPERATOR | |
|---|---|---|---|
| ame: Premcor Refining Group, Inc. | | Name: | |
| dress: 201 E. Hawthorne | | Address: | |
| y: Hartford | | City: | |
| ate: Illinois | Zip Code: 62048 | State: | Zip Code: |
| one #: 618/254-7301 | | Phone #: | |

| ERSON(S) INTERVIEWED | TITLE | PHONE # |
|---|---|---|
| ul Christian | Project Manager/Burns and McDonnell | 636/305-0077 |
| eve Haug | Environmental Protection Specialist | 618/254-7301 |
| | | |
| | | |
| | | |
| | | |

| SPECTION PARTICIPANT(S) | AGENCY/DIVISION | PHONE # |
|---|---|---|
| ris Cahnovsky | IEPA/BOL | 618/346-5120 |
| m Miller | IEPA/BOL | 618/346-5120 |
| hy Vieregge | IEPA/BOL | 618/346-5120 |
| | | |
| | | |
| | | |

| EPARED BY | AGENCY/DIVISION | PHONE # |
|---|---|---|
| ris Cahnovsky | IEPA/BOL | 618/346-5120 |

## SUMMARY OF APPARENT VIOLATIONS

| REA | SECTION | X | AREA | SECTION | X | AREA | SECTION | X |
|---|---|---|---|---|---|---|---|---|
| | 21(a) | X | | | | | | |
| | 21(e) | X | | | | | | |
| | 21(f) | X | | | | | | |
| | 703.121(a) | X | | | | | | |
| DPP | 725.131 | X | | | | | | |
| CP | 725.151(b) | X | | | | | | |
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| | | | | | | | | |

: Continuing Violation

1190500002 – Madison County
Premcor Refining Group
Date of Inspection: April 10, 2001
Prepared by: Chris Cahnovsky

## NARRATIVE

On April 10, 2001, I conducted a Compliance Sampling Inspection at Premcor Refining Group in Hartford, Illinois. Members of the Illinois EPA sampling team were Tom Miller and Kathy Vieregge. Present representing Premcor were Steve Haug and Paul Christian, Project Manager for Burns and McDonnell.

Premcor's Hartford refinery is a coking refinery with a capacity to process 70,000 barrels per day of heavy, sour crude. The refinery processes more than 60,000 barrels per day (BPD) of intermediate and sour crude oils to produce more than 30,000 BPD of gasoline and more than 21,000 BPD of diesel fuels. In addition, the refinery produces more than 1,000 BPD of asphalt, more than 800 BPD of liquefied petroleum and greater than 4,000 BPD of petroleum coke. The processes at Premcor include the crude unit, delayed coker unit, fluid catalytic cracker, alkylation unit, reformer, distillate hydrodesulfurization unit, total isomerization process, and the biological oxidation unit (wastewater treatment process).

The purpose of this inspection was to obtain samples for laboratory analysis of the soils and sludge in the Triangle Surface Impoundment.. The Triangle Surface Impoundment is located south of Tank 200-1. This impoundment measures about 130-foot by 180-foot by 130- foot by 9-foot deep and covers an area about 8,450 $ft^2$. The Triangle Surface Impoundment is a manmade-diked excavation formed primarily of earthen materials. Per Premcor, this impoundment contains crude oil tank bottoms. The surface impoundment was covered with a dry crust of weathered petroleum hydrocarbons. The sludge under the crust was a wet sticky oily sludge. Per Mr. Haug, no waste has been placed in this impoundment in over 23 years. At this time, the Illinois EPA does not possess evidence that the waste placed in this impoundment is subject to RCRA.

The samples were collected in accordance with the Bureau of Lands Sampling Procedures Guidance Manual (1997) and the Site-Specific Sampling and Analysis Plan Surface Impoundment by Tank 200-1, Premcor Refining Group Hartford, Illinois, April 2001. The SAP called for the collection of six samples. However, only two samples were obtained due to the oily sticky nature of the soil/sludge and the difficulty in collecting the samples. The Illinois EPA sampling team collected duplicate samples for Premcor's consultants Burns and McDonnell.

The samples were obtained using pre-cleaned stainless steel augurs. Sample X201 was taken from the southeast corner of the impoundment. The auger was advanced to the bottom of the impoundment to collect a 0-6-inch sample of the bottom soil. The impoundment was about three feet deep at this sampling location. Sample X202 was taken from the middle of the west side of the impoundment. The auger was advanced to the bottom to collect a 0-6-inch sample of the bottom soil. The impoundment was about five feet deep at this sampling location. Both samples were placed in glass jars with polyethylene lids. The sample containers were placed in a cooler of ice for transport to the Agency's laboratories. The auger handle was decontaminated between use with liquinox wash and a final rinse with de-ionized water.

A portion of the samples was sent to the Illinois EPA's Springfield laboratory for volatile organic and semi-volatile organic analysis and the paint filter test. A portion of the samples was also sent to the Illinois EPA's Champaign laboratory for total metal and TCLP metal analysis. The Collinsville Office received the results of the samples on July 11, 2001. The detailed analytical results are attached to this narrative. Tables 1, 2 and 3 are a summary of the results.

Sample X201 exceeded the 35 Ill. Adm. Code 742: Tiered Approach to Corrective Action Objectives, Tier 1 Soil Remediation Objectives for Residential Properties Ingestion Exposure Route-Specific Values for Soils for Benzo(a)anthracene, Benzo(b)flouranthene, Benzo(a)pyrene, Dibenzo(ah)anthracene and Arsenic. Sample X201 also exceeded the Soil Component of the Groundwater Ingestion Exposure Route Values for benzene, Ethylbenzene, Xylenes and Lead.

Sample X202 exceeded the 35 Ill. Adm. Code 742: Tiered Approach to Corrective Action Objectives, Tier 1 Soil Remediation Objectives for Residential Properties Ingestion Exposure Route-Specific Values for Soils for Naphthalene, Benzo(a)anthracene, Benzo(b)flouranthene, Benzo(a)pyrene, Indeno(1,2,3-CD)pyrene, Chrysene, Dibenzo(ah)anthracene, Arsenic and Beryllium. Sample X201 also exceeded the Soil Component of the Groundwater Ingestion Exposure Route Values for Benzene, Toluene, Ethylbenzene, Xylenes and Lead.

On April 12, 2001, Premcor began removing waste from the Triangle Surface Impoundment. As of July 11, 2001 Premcor has removed the following from the Triangle Surface Impoundment.

- 3010 barrels of oil recovered. This amount was recovered after the separation of solids and liquids at the centrifuge. This material was sent to the crude unit for re-refining.

- 5850 barrels of water recovered. This is the amount recovered after the separation of solids from liquid and the centrifuge. The recovered water was reprocessed through the Bio-Unit.

- 66 tons of AFCM were recovered from the centrifuge and injected into the Delayed Coker Unit.

- 2500 barrels of slurried Triangle waste still on-site waiting to be processed at the centrifuge.

- 1066 barrels of waste estimated to still be in the Triangle Surface Impoundment.

On July 23, 2001, I spoke telephonically with Bill Irwin, Environmental Supervisor of Premcor. Mr. Irwin and I discussed the possibility of Premcor entering into the State of Illinois Site Remediation Program (SRP). Mr. Irwin stated that Premcor intentions are to enter into the SRP for the clean up of the Triangle Surface Impoundment. On July 23, 2001, I mailed Mr. Irwin a copy of the SRP enrollment application.

| Table 1: Organic Tier 1 - Cleanup Objectives for Soil (mg/Kg) | | | |
|---|---|---|---|
| CHEMICAL | X201 | X202 | TACO[1] |
| Naphthalene | 7.6 | 22 | 12 |
| 2-Methylnaphthalene | 63 | 290 | --- |
| Acenaphthene | 2.1 | 14 | 570 |
| Anthracene | 0.21K | 14 | 12,000 |
| Dibenzofuran | 2.1 | 8.4 | --- |
| Fluorene | 6.6 | 26 | 560 |
| Phenanthrene | 22 | 130 | 140 |
| Flouranthene | 2.0 | 17 | 3,100 |
| Pyrene | 17 | 150 | 2,300 |
| Benzo(a)Anthracene | 8.5 | 89 | 0.9 |
| Chrysene | 15 | 140 | 88 |
| Benzo(b)Flouranthene | 2.4 | 23 | 0.9 |
| Benzo(a)Pyrene | 4.0 | 48 | 0.09 |
| Indeno(1,2,3-CD)Pyrene | 0.26 | 51 | 0.9 |
| Dibenzo(AH)Anthracene | 0.59 | 7.9 | 0.09 |
| Benzo(GHI)Perylene | 1.3 | 17 | 2,300 |
| Benzene | 23 | 36 | 0.03 |
| Toluene | 4.5K | 160 | 12 |
| Ethylbenzene | 120 | 140 | 13 |
| Xylenes | 380 | 800 | 150 |

1. 35 Ill. Adm. Code Part 742: Tiered Approach to Corrective Action Objectives - Tier 1 Soil Remediation Objectives for Residential Properties.

| Table 2: TCLP Metals Tier 1 Cleanup Objectives for Soil (mg/L) | | | |
|---|---|---|---|
| Parameter/sample (TCLP) | X201 | X202 | TACO[1] |
| Antimony | 0.006K | 0.006K | 0.006 |
| Arsenic | 0.010K | 0.013 | 0.05 |
| Barium | 0.96 | 1.3 | 2.0 |
| Beryllium | 0.001K | 0.0012 | 0.004 |
| Cadmium | 0.005K | 0.005K | 0.005 |
| Chromium | 0.005K | 0.005K | 0.1 |
| Lead | 0.024 | 0.031 | 0.0075 |
| Mercury | 0.001K | 0.001K | 0.002 |
| Nickel | 0.077 | 0.049 | 0.1 |
| Selenium | 0.010K | 0.013 | 0.05 |
| Silver | 0.005K | 0.005K | 0.05 |
| Vanadium | 0.005K | 0.005K | 0.049 |
| Zinc | 0.25 | 0.20 | 5.0 |

| Table 3: Total Metals Tier 1 Cleanup Objectives for Soil (mg/Kg) | | | |
|---|---|---|---|
| Parameter/sample (TOTAL) | X201 | X202 | TACO[1] |
| Antimony | 1.1K | 0.85K | 31 |
| Arsenic | 7.6 | 4.6 | 0.4 |
| Barium | 330 | 200 | 5500 |
| Beryllium | .18K | .32 | 0.1 |
| Boron | 9.1K | 7.1K | 7000 |
| Cadmium | .91K | .71K | 78 |
| Chromium | 6.4 | 11 | 270 |
| Cobalt | 5.1 | 8.9 | 4700 |
| Copper | 23 | 16 | 2900 |
| Iron | 6200 | 7700 | --- |
| Lead | 43 | 17 | 400 |
| Mercury | .10K | .10K | 10 |
| Nickel | 17 | 15 | 1600 |
| Selenium | 1.8K | 1.4K | 390 |
| Silver | .91K | .71K | 390 |
| Vanadium | 23 | 19 | 550 |
| Zinc | 90 | 55 | 23,000 |

1. 35 Ill. Adm. Code Part 742: Tiered Approach to Corrective Action Objectives – Tier 1 Soil Remediation Objectives for Residential Properties.

THE ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LAND POLLUTION
RECEIPT FOR SAMPLES

Site Inventory #: L1190200005 Facility Name: Premcor Refining Group
Federal I.D. #: _ _ _ _ _ _ _ _ _ _ _ _ County: Madison

| Sample #: | Consisting of the Indicated # of Bottles | Date Collected |
|---|---|---|
| X201 | 6 | 4/10/01 |
| X202 | 6 | 4/10/01 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Duplicate Samples requested: [X] Yes [ ] No

Receipt for samples listed above is hereby acknowledged.

Signature Owner/Operator/Agent: [signature] — Title: Premcor Environmental Specialist — Date: 4/10/01

Agency Representative: [signature] — Title: EPS — Date: 4/10/01

COMMENTS: VOC, SVOC, PCB, Total/TCLP VOC + SVOC, Paint Filter, Flash point, Total/TCLP metals

NOTE: White Copy - Division File
Yellow Copy - Regions
Pink Copy - Owner/Operator/Agent

GS:TH:lhh:AC-XI

IL 532-1752
LPC 309 12/88

DLPC/FOS Chain of Custody Document
(Analysis Request and Receipt for Samples)
Page 1 of 1

| L 11 | 1170500002 | Madison | Hartford |
|---|---|---|---|

USEPA ID#: ILD041889023

Premcor Refining Group

Groundwater File

Project Manager's Name/Address/Phone #:
Chris Cahnovsky, c/o IEPA
2009 Mall Street
Collinsville, IL 62001
618 1346-5120

IEPA Laboratory (circle one)
2125 S. 1st Street, Champaign, IL 61820, 217/278-5858
825 N. Rutledge Street, Springfield, IL 62702, 217/782-9780

Other Laboratory Name, Address, and Phone #

UPS

Case # (if applicable)

Collection Information

| TOTL 2 | TCLP 2 | Field Sample # | HOLD (y/n) | Split (y/n) | # Bottles | VOL (oz.) | Date Collected & Sealed | Time Collected (24 hr clk) | Time Sealed (24 hr clk) | Sampler's Initials | Collector or Laboratory Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|
| X | X | X201 | N | Y | 1 | 16 | 4/10/01 | 10:25 | 10:45 | CNC | |
| X | X | X202 | N | Y | 1 | 16 | 4/10/01 | 10:55 | 11:17 | CNC | |

RECEIVED
IEPA
MAY 10 2001
COLLINSVILLE OFFICE

Receipt for Samples: Collection of the above-listed sample(s) at the indicated site is hereby acknowledged. Split(s) Offered? y / n Accepted? y / n

Signature/Title of Facility Representative, Date 4/10/01 Steve T. Hoy Environmental Specialist

Samplers (printed names and signatures)
Chris Cahnovsky
Tom Miller
Kathy Vieregge, Kathy Vieregge

Sealer: I certify that I sealed the samples listed above and I wrote my initials, the date, and the time on the seal(s).

| Sealer's Signature & Initials | Date | Time (24 hr clk) |
|---|---|---|
| CNC | 4/10/01 | 14:42 |

Carriers: I certify that I received the container(s) holding the above sample(s) with the seal(s) intact and the sealer's initials and sealing date written on the seal(s).

| Relinquished by (Sealer) | Date | Time (24 hr clk) | Received by | Date | Time (24 hr clk) |
|---|---|---|---|---|---|
| | 4/10/01 | 16:00 | UPS | 4/10/01 | 16:00 |

☐ To Container for Shipment

IL 532-2311
LPC 525

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

AMPLE NUMBER : 3105508
AMPLING POINT DESC. : PREMCOR REFINING GROUP X201

UBMITTING SOURCE # : 1190500002 SITE # :
ATE COLLECTED : 010410 TIME COLLECTED : 1045 SAMPLING PROGRAM :

OLLECTED BY : CNC DELIVERED BY : UPS
OMMENTS :
UNDING CODE : LP41 AGENCY ROUTING : 00 UNIT CODE :
AM TYPE CODE : SAMPLE PURPOSE CODE : 0 REPORTING INDICATOR : B

ATE RECEIVED : 010411 TIME RECEIVED : 0900 RECEIVED BY : PMD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : CEO NOTE : K = LESS THAN VALUE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10000 | PH,FINAL TCLP EXT | UNITS | 4.9 | A10000 | PH,INIT TCLP EXT | UNITS | 7.5 |
| 0318 | SOLIDS,% WET SAMPL | % | 55.2 | P49134 | MERCURY,TCLP SLD | MG/L | 0.001K |
| 9023 | MERCURY,SW84 D/WT | MG/KG | 0.10K | P49100 | ANTIMONY,TCLP SLD | MG/L | 0.006K |
| 49099 | ARSENIC,TCLP SLD | MG/L | 0.010K | P49101 | BARIUM,TCLP SLD | MG/L | 0.96 |
| 9102 | BERYLLIUM,TCLP SLD | MG/L | 0.001K | P49103 | CADMIUM,TCLP SLD | MG/L | 0.005K |
| 49105 | CHROMIUM,TCLP SLD | MG/L | 0.005K | P49109 | LEAD,TCLP SLD | MG/L | 0.024 |
| 49112 | NICKEL,TCLP SLD | MG/L | 0.077 | P49114 | SELENIUM,TCLP SLD | MG/L | 0.010K |
| 9115 | SILVER,TCLP SLD | MG/L | 0.005K | P49118 | THALLIUM,TCLP SLD | MG/L | 0.010K |
| 49119 | VANADIUM,TCLP SLD | MG/L | 0.005K | P49074 | ZINC,TOT,SLD,TCLP | MG/L | 0.25 |
| 9581 | CALCIUM,SW84 D/WT | MG/KG | 3700 | P79650 | MAGNESIUM,SW D/WT | MG/KG | 1900 |
| 9705 | SODIUM,SW846 D/WT | MG/KG | 91K | P00937 | POTASSIUM,SW D/WT | MG/KG | 300 |
| 97545 | ALUMINUM,SW8 D/WT | MG/KG | 1500 | P79547 | ANTIMONY,SW8 D/WT | MG/KG | 1.1K |
| 9548 | ARSENIC,SW84 D/WT | MG/KG | 7.6 | P79550 | BARIUM,SW846 D/WT | MG/KG | 330 |
| 8463 | BORON,SW846 D/WT | MG/KG | 9.1K | P79556 | BERYLLIUM,SW D/WT | MG/KG | 0.18K |
| 79580 | CADMIUM,SW84 D/WT | MG/KG | 0.91K | P79591 | CHROMIUM,SW8 D/WT | MG/KG | 6.4 |
| 9594 | COPPER,SW846 D/WT | MG/KG | 23 | P79593 | COBALT,SW846 D/WT | MG/KG | 5.1 |
| 79645 | IRON,SW846 D/WT | MG/KG | 6200 | P79649 | LEAD,SW846 D/WT | MG/KG | 43 |
| 9651 | MANGANESE,SW D/WT | MG/KG | 130 | P79671 | NICKEL,SW846 D/WT | MG/KG | 17 |
| 9703 | SELENIUM,SW8 D/WT | MG/KG | 1.8K | P79704 | SILVER,SW846 D/WT | MG/KG | 0.91K |
| 9706 | STRONTIUM,SW D/WT | MG/KG | 22 | P79712 | THALLIUM,SW8 D/WT | MG/KG | 1.8K |
| 9722 | VANADIUM,SW8 D/WT | MG/KG | 23 | P79726 | ZINC,SW846 D/WT | MG/KG | 90 |

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

SAMPLE NUMBER : B105509
SAMPLING POINT DESC. : PREMCOR REFINING GROUP X202

SUBMITTING SOURCE # : 1190500002 SITE # :
DATE COLLECTED : 010410 TIME COLLECTED : 1055 SAMPLING PROGRAM :

COLLECTED BY : CVC DELIVERED BY : UPS
COMMENTS :
FUNDING CODE : LP41 AGENCY ROUTING : 00 UNIT CODE :
PGM TYPE CODE : SAMPLE PURPOSE CODE : 0 REPORTING INDICATOR : B

DATE RECEIVED : 010411 TIME RECEIVED : 0900 RECEIVED BY : PMD
LAB OBSERVATIONS : TRIP BL SAM# :
SUPERVISORS INITIALS : CEO NOTE : K = LESS THAN VALUE

| | | | | | |
|---|---|---|---|---|---|
| A10000 | PH/FINAL TCLP EXT UNITS | 4.7 | A10000 | PH/INIT TCLP EXT UNITS | 7.1 |
| P70318 | SOLIDS/% WET SAMPL % | 70.7 | P49134 | MERCURY/TCLP SLD MG/L | 0.001K |
| P99023 | MERCURY/SW84 D/WT MG/KG | 0.10K | P49100 | ANTIMONY/TCLP SLD MG/L | 0.006K |
| P49099 | ARSENIC/TCLP SLD MG/L | 0.013 | P49101 | BARIUM/TCLP SLD MG/L | 1.3 |
| P49102 | BERYLLIUM/TCLP SLD MG/L | 0.0012 | P49103 | CADMIUM/TCLP SLD MG/L | 0.005K |
| P49105 | CHROMIUM/TCLP SLD MG/L | 0.005K | P49109 | LEAD/TCLP SLD MG/L | 0.031 |
| P49112 | NICKEL/TCLP SLD MG/L | 0.049 | P49114 | SELENIUM/TCLP SLD MG/L | 0.013 |
| P49115 | SILVER/TCLP SLD MG/L | 0.005K | P49118 | THALLIUM/TCLP SLD MG/L | 0.010K |
| P49119 | VANADIUM/TCLP SLD MG/L | 0.005K | P49074 | ZINC/TOT/SLD/TCLP MG/L | 0.20 |
| P79581 | CALCIUM/SW84 D/WT MG/KG | 5300 | P79650 | MAGNESIUM/SW D/WT MG/KG | 3400 |
| P79705 | SODIUM/SW846 D/WT MG/KG | 71K | P00937 | POTASSIUM/SW D/WT MG/KG | 600 |
| P97545 | ALUMINUM/SW8 D/WT MG/KG | 5200 | P79547 | ANTIMONY/SW8 D/WT MG/KG | 0.85K |
| P79548 | ARSENIC/SW84 D/WT MG/KG | 4.6 | P79550 | BARIUM/SW846 D/WT MG/KG | 200 |
| P78463 | BORON/SW846 D/WT MG/KG | 7.1K | P79556 | BERYLLIUM/SW D/WT MG/KG | 0.32 |
| P79580 | CADMIUM/SW84 D/WT MG/KG | 0.71K | P79591 | CHROMIUM/SW8 D/WT MG/KG | 11 |
| P79594 | COPPER/SW846 D/WT MG/KG | 16 | P79593 | COBALT/SW846 D/WT MG/KG | 8.9 |
| P79645 | IRON/SW846 D/WT MG/KG | 7700 | P79649 | LEAD/SW846 D/WT MG/KG | 17 |
| P79651 | MANGANESE/SW D/WT MG/KG | 130 | P79671 | NICKEL/SW846 D/WT MG/KG | 15 |
| P79703 | SELENIUM/SW8 D/WT MG/KG | 1.4K | P79704 | SILVER/SW846 D/WT MG/KG | 0.71K |
| P79706 | STRONTIUM/SW D/WT MG/KG | 22 | P79712 | THALLIUM/SW8 D/WT MG/KG | 1.4K |
| P79722 | VANADIUM/SW8 D/WT MG/KG | 19 | P79726 | ZINC/SW846 D/WT MG/KG | 55 |

[redacted]US [redacted]n of [redacted]ody [redacted]men[redacted] | L[redacted] | [redacted]9[redacted]0002[redacted] | Madison [redacted] | [redacted] Hartford [redacted]

Analysis Request and Receipt for Samples)

'age 1 of 1

Section [04]: F

USEPA ID#: ILD041889023

Site Name [19]: Premcor Refining Group

Groundwater File

'roject Manager's Name/Address/Phone #:
Chris Cahnovsky, c/o IEPA
2009 Mall Street
Collinsville, IL 62001
618 346-5120

IEPA Laboratory (circle one)
2125 S. 1st Street, Champaign, IL 61820, 217/278-5858
825 N. Rutledge Street, Springfield, IL 62702 217/782-9780

Other Laboratory Name, Address, and Phone #:

Delivered by [23]: Mike Grant

ase # (if applicable)

Parameter Group [03] & Other Analyses | Collection Information

| Lab Sample # [01] | VOC | SVOC | PCB | TCLP SVOC | TCLP VOC | Flash Point | Paint Filter | Field Sample # | HOLD (y/n) | Split (y/n) | # Bottles | VOL (oz.) | [20] Date Collected & Sealed | [21] Time Collected (24 hr clk) | Time Sealed (24 hr clk) | [22] Sampler's Initials | [24] Collector or Laboratory Comments | Seal Intact? (y/n) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 103817 | X | X | X | X | X | X | X | X201 | N | Y | 5 | 52 | 4/10/01 | 10:25 | 10:45 | CNC | | |
| 103818 | X | X | X | X | X | X | X | X202 | N | Y | 5 | 52 | 4/10/01 | 10:55 | 11:17 | CNC | | |

RECEIVED
IEPA
JUL 11 2001
COLLINSVILLE OFFICE

RECEIVED
JUL 09 2001
IEPA-DLPC

eceipt for Samples: Collection of the above-listed sample(s) at the indicated site is hereby acknowledged.

Split(s) Offered? Y / n   Accepted? Y / n

ignature/Title of Facility Representative; Date 4/10/01 [signature] Environmental Specialist

amplers (printed names and signatures)
Chris Cahnovsky [signature]
Tom Miller [signature]
Kathy Vieregge Kathy Vieregge

Sealer: I certify that I sealed the samples listed above and I wrote my initials, the date, and the time on the seal(s).

| Sealer's Signature & Initials | Date | Time (24 hr clk) |
|---|---|---|
| [signature] CNC | 4/10/01 | 14:42 |

arriers: I certify that I received the container(s) holding the above sample(s) with the seal(s) intact and the sealer's initials and sealing date written on the seal(s).

| Relinquished by (Sealer) | Date | Time (24 hr clk) | Received by | Date | Time (24 hr clk) |
|---|---|---|---|---|---|
| [signature] | 4/11/01 | 09:12 | [signature] | 4/11/01 | 09:12 |

☐ To Container for Shipment

Laboratory Custodian: I certify that I received the container holding the above sample(s) with the seal integrity as indicated above and the sealer's initials and the date written on the seal(s). After being received, this/these same sample(s) will be retained by laboratory personnel at all times or locked in a secured area.

Printed Name, Signature, and Initials [07] | Date [05] | Time [06] (24 hr clk) | Sample Temp. (°C) | Supervisor releasing results (signature): | Date:

L 532-2311
PC 525

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

PLE NUMBER : 0103817
PLING POINT DESC. : MADISON/HARTFORD/PREMCOR REFINING GROUP

MITTING SOURCE # : 1190500002 SITE # :
E COLLECTED : 010410 TIME COLLECTED : 1025 SAMPLING PROGRAM :

LECTED BY : CNC DELIVERED BY : CNC
MENTS : VOC/SVOC/PCB/TCLP VOC/TCLP SVOC/FLASH POINT/PAINT FILTER
DING CODE : LP41 AGENCY ROUTING : -- UNIT CODE :
TYPE CODE : SAMPLE PURPOSE CODE : F REPORTING INDICATOR : 3

E RECEIVED : 010411 TIME RECEIVED : 1130 RECEIVED BY : JIM
OBSERVATIONS : 1-32OZ/2-6OZ/2-2OZ TRIP BL SAM# :
ERVISORS INITIALS : CMC NOTE : K = LESS THAN VALUE

| | | |
|---|---|---|
| 519 | TOTAL PCBS | UG/KG : 100K |
| 594 | PHENOL | UG/G : 0.21K |
| 273 | BIS(2-CHLOROETHYL)ETHER | UG/G : 0.21K |
| 586 | 2-CHLOROPHENOL | UG/G : 0.21K |
| 566 | 1,3-DICHLOROBENZENE | UG/G : 0.21K |
| 571 | 1,4-DICHLOROBENZENE | UG/G : 0.21K |
| 147 | BENZYL ALCOHOL | UG/G : ------ |
| 536 | 1,2-DICHLOROBENZENE | UG/G : 0.21K |
| 000 | 2-METHYLPHENOL | UG/G : 0.21K |
| 283 | BIS(2-CHLOROISOPROPYL)ETHER | UG/G : 0.21K |
| 000 | 4-METHYLPHENOL | UG/G : 0.21K |
| 428 | N-NITROSO-DI-N-PROPYLAMINE | UG/G : 0.21K |
| 396 | HEXACHLOROETHANE | UG/G : 0.21K# |
| 47 | NITROBENZENE | UG/G : 0.21K |
| 08 | ISOPHORONE | UG/G : 0.21K |
| 91 | 2-NITROPHENOL | UG/G : 0.21K |
| 06 | 2,4-DIMETHYLPHENOL | UG/G : 0.21K |
| 47 | BENZOIC ACID | UG/G : ------ |
| 78 | BIS(2-CHLOROETHOXY)METHANE | UG/G : 0.21K |
| 01 | 2,4-DICHLOROPHENOL | UG/G : 0.21K |
| 51 | 1,2,4-TRICHLOROBENZENE | UG/G : 0.21K |
| 96 | NAPHTHALENE | UG/G : 7.6 |
| 00 | 4-CHLOROANILINE | UG/G : 0.21K |
| 91 | HEXACHLOROBUTADIENE | UG/G : 0.21K |
| 52 | 4-CHLORO-3-METHYLPHENOL | UG/G : 0.21K |
| 16 | 2-METHYLNAPHTHALENE | UG/G : 63 |
| 86 | HEXACHLOROCYCLOPENTADIENE | UG/G : 0.21K# |
| 21 | 2,4,6-TRICHLOROPHENOL | UG/G : 0.21K |
| 87 | 2,4,5-TRICHLOROPHENOL | UG/G : 0.21K |

V706

LE NUMBER : 0103817

| | | |
|---|---|---|
| 531 | 2-CHLORONAPHTHALENE | UG/G : 0.21K |
| 003 | 2-NITROANILINE | UG/G : 0.21K |
| 341 | DIMETHYLPHTHALATE | UG/G : 0.21K |
| 200 | ACENAPHTHYLENE | UG/G : 0.21K |
| 626 | 2,6-DINITROTOLUENE | UG/G : 0.21K |
| 300 | 3-NITROANILINE | UG/G : 0.21K |
| 205 | ACENAPHTHENE | UG/G : 2.1 |
| 616 | 2,4-DINITROPHENOL | UG/G : 1.4K# |
| 646 | 4-NITROPHENOL | UG/G : 0.21K |
| 302 | DIBENZOFURAN | UG/G : 2.1 |
| 611 | 2,4-DINITROTOLUENE | UG/G : 0.21K |
| 336 | DIETHYLPHTHALATE | UG/G : 0.21K |
| 641 | 4-CHLOROPHENYL PHENYL ETHER | UG/G : 0.21K |
| 381 | FLUORENE | UG/G : 6.6 |
| 000 | 4-NITROANILINE | UG/G : 0.21K |
| 000 | 4,6-DINITRO-2-METHYLPHENOL | UG/G : 0.35K# |
| 636 | 4-BROMOPHENYL PHENYL ETHER | UG/G : 0.21K |
| 700 | HEXACHLOROBENZENE | UG/G : 0.21K |
| 032 | PENTACHLOROPHENOL | UG/G : 0.21K |
| 461 | PHENANTHRENE | UG/G : 22 |
| 220 | ANTHRACENE | UG/G : 0.21K |
| 110 | DI-N-BUTYLPHTHALATE | UG/G : 0.21K |
| 376 | FLUORANTHENE | UG/G : 2.0 |
| 69 | PYRENE | UG/G : 17# |
| 292 | BUTYL BENZYL PHTHALATE | UG/G : 0.21K |
| 31 | 3,3'-DICHLOROBENZIDINE | UG/G : 0.21K |
| 26 | BENZO(A)ANTHRACENE | UG/G : 8.5 |
| 320 | CHRYSENE | UG/G : 15 |
| 00 | BIS(2-ETHYLHEXYL)PHTHALATE | UG/G : 0.21K |
| 96 | DI-N-OCTYLPHTHALATE | UG/G : 0.21K |
| 230 | BENZO(B)FLUORANTHENE | UG/G : 2.4 |
| 42 | BENZO(K)FLUORANTHENE | UG/G : 0.21K |
| 247 | BENZO(A)PYRENE | UG/G : 4.0 |
| 403 | INDENO(1,2,3-CD)PYRENE | UG/G : 0.26# |
| 56 | DIBENZO(AH)ANTHRACENE | UG/G : 0.59# |
| 21 | BENZO(GHI)PERYLENE | UG/G : 1.3# |

ACCEPTABLE QUALITY CONTROL COULD NOT BE
OBTAINED FOR THIS ANALYTE.

ACCEPTABLE QUALITY CONTROL COULD NOT BE
OBTAINED FOR THIS ANALYSIS POSSIBLY DUE TO
ATRIX EFFECT.

X201

LE NUMBER : 0103317

THIS SAMPLE WAS ANALYZED AFTER THE 30 DAY
HOLDING PERIOD.

| | | |
|---|---|---|
| 418 CHLOROMETHANE | UG/G : | 4.5K |
| 413 BROMOMETHANE | UG/G : | 5.9# |
| 175 VINYL CHLORIDE | UG/G : | 4.5K |
| 311 CHLOROETHANE | UG/G : | 4.5K |
| 423 METHYLENE CHLORIDE | UG/G : | 4.5K |
| 552 ACETONE | UG/G : | 23K |
| 488 TRICHLOROFLUOROMETHANE | UG/G : | 4.5K |
| 277 BROMOCHLOROMETHANE | UG/G : | 4.5K |
| 041 CARBON DISULFIDE | UG/G : | 4.5K |
| 501 1,1-DICHLOROETHYLENE | UG/G : | 4.5K |
| 496 1,1-DICHLOROETHANE | UG/G : | 4.5K |
| 546 TRANS-1,2-DICHLOROETHYLENE | UG/G : | 4.5K |
| 093 CIS-1,2-DICHLOROETHYLENE | UG/G : | 4.5K |
| 106 CHLOROFORM | UG/G : | 4.5K |
| 531 1,2-DICHLOROETHANE | UG/G : | 4.5K |
| 595 2-BUTANONE(MEK) | UG/G : | 23K |
| 506 1,1,1-TRICHLOROETHANE | UG/G : | 4.5K |
| 102 CARBON TETRACHLORIDE | UG/G : | 4.5K |
| 491 METHYL TERT BUTYL ETHER | UG/G : | 4.5K |
| 101 DICHLOROBROMOMETHANE | UG/G : | 4.5K |
| 541 1,2-DICHLOROPROPANE | UG/G : | 4.5K |
| 704 CIS-1,3-DICHLOROPROPENE | UG/G : | 4.5K |
| 180 TRICHLOROETHYLENE | UG/G : | 4.5K |
| 105 CHLORODIBROMOMETHANE | UG/G : | 4.5K |
| 511 1,1,2-TRICHLOROETHANE | UG/G : | 4.5K |
| 124 BENZENE | UG/G : | 23 |
| 599 TRANS-1,3-DICHLOROPROPENE | UG/G : | 4.5K |
| 576 2-CHLOROETHYLVINYL ETHER | UG/G : | 0.5K |
| 04 BROMOFORM | UG/G : | 11K |
| 133 4-METHYL-2-PENTANONE(MIBK) | UG/G : | 4.5K |
| 03 2-HEXANONE(MBK) | UG/G : | 4.5K |
| 75 TETRACHLOROETHYLENE | UG/G : | 4.5K |
| 16 1,1,2,2-TETRACHLOROETHANE | UG/G : | 4.5K |
| 31 TOLUENE | UG/G : | 4.5K |
| 01 CHLOROBENZENE | UG/G : | 4.5K |
| 13 ETHYLBENZENE | UG/G : | 120 |
| 28 STYRENE | UG/G : | 4.5K |
| 51 XYLENE | UG/G : | 380 |

SOPROPYLBENZENE UG/G : 43

X201

E NUMBER : 0103817

8.9UG/G FOUND IN LABORATORY BLANK.
ROBABLE LABORATORY CONTAMINATION.
ACCEPTABLE QUALITY CONTROL

OULD NOT BE OBTAINED FOR
CB ANALYSIS.

W-846 METHOD 8260 QUALITY CONTROL CRITERIA

WAS NOT MET FOR THIS SAMPLE.

O TCLP COMPOUND ABOVE REGULATORY LIMITS
DETECTED IN VOLATILE AND SEMI-VOLATILE

NALYSIS.

OTAL NON-TARGET COMPOUNDS UG/G; 6200

NON-TARGET COMPOUNDS INCLUDE;
ISC. PNAS
3-SUBSTITUTED BENZENES
LIPHATIC HYDROCARBONS

ISC. ORGANIC COMPOUNDS
ESULTS OF PAINT FILTER TEST SHOW NO FREE
IQUIDS PRESENT.

Y201

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

MPLE NUMBER : 0103818
MPLING POINT DESC. : MADISON/HARTFORD/PREMCOR REFINING GROUP

BMITTING SOURCE # : SITE # :
TE COLLECTED : 010410 TIME COLLECTED : 1055 SAMPLING PROGRAM :

LECTED BY : CNC DELIVERED BY : CNC
MMENTS : VOC/~~SVOC/PCB/TCLP VOC/TCLP SVOC/PAINT FILTER/~~ FLASH POINT
NDING CODE : LP41 AGENCY ROUTING : -- UNIT CODE :
 TYPE CODE : SAMPLE PURPOSE CODE : F REPORTING INDICATOR : 3

TE RECEIVED : 010411 TIME RECEIVED : 1130 RECEIVED BY : JIM
 OBSERVATIONS : 1-32OZ/2-6OZ/2-2OZ TRIP BL SAM# :
PERVISORS INITIALS : CMC NOTE : K = LESS THAN VALUE

| | | |
|---|---|---|
| 519 | TOTAL PCBS | UG/KG : 100K |
| 694 | PHENOL | UG/G : 0.41K |
| 273 | BIS(2-CHLOROETHYL)ETHER | UG/G : 0.41K |
| 586 | 2-CHLOROPHENOL | UG/G : 0.41K |
| 566 | 1,3-DICHLOROBENZENE | UG/G : 0.41K |
| 571 | 1,4-DICHLOROBENZENE | UG/G : 0.41K |
| 147 | BENZYL ALCOHOL | UG/G : ------ |
| 536 | 1,2-DICHLOROBENZENE | UG/G : 0.41K |
| 000 | 2-METHYLPHENOL | UG/G : 0.41K |
| 283 | BIS(2-CHLOROISOPROPYL)ETHER | UG/G : 0.41K |
| 000 | 4-METHYLPHENOL | UG/G : 0.41K |
| 428 | N-NITROSO-DI-N-PROPYLAMINE | UG/G : 0.41K |
| 396 | HEXACHLOROETHANE | UG/G : 0.41K# |
| 447 | NITROBENZENE | UG/G : 0.41K |
| 408 | ISOPHORONE | UG/G : 0.41K |
| 591 | 2-NITROPHENOL | UG/G : 0.41K |
| 606 | 2,4-DIMETHYLPHENOL | UG/G : 0.41K |
| 247 | BENZOIC ACID | UG/G : ------ |
| 278 | BIS(2-CHLOROETHOXY)METHANE | UG/G : 0.41K |
| 601 | 2,4-DICHLOROPHENOL | UG/G : 0.41K |
| 551 | 1,2,4-TRICHLOROBENZENE | UG/G : 0.41K |
| 596 | NAPHTHALENE | UG/G : 22 |
| 000 | 4-CHLOROANILINE | UG/G : 0.41K |
| 391 | HEXACHLOROBUTADIENE | UG/G : 0.41K |
| 52 | 4-CHLORO-3-METHYLPHENOL | UG/G : 0.41K |
| 416 | 2-METHYLNAPHTHALENE | UG/G : 290 |
| 386 | HEXACHLOROCYCLOPENTADIENE | UG/G : 0.41K# |
| 21 | 2,4,6-TRICHLOROPHENOL | UG/G : 0.41K |
| 587 | 2,4,5-TRICHLOROPHENOL | UG/G : 0.41K |

X202

E NUMBER : D103616

| | | | |
|---|---|---|---|
| 31 | 2-CHLORONAPHTHALENE | UG/G : | 0.41K |
| 00 | 2-NITROANILINE | UG/G : | 0.41K |
| 341 | DIMETHYLPHTHALATE | UG/G : | 0.41K |
| 200 | ACENAPHTHYLENE | UG/G : | 0.41K |
| 626 | 2,6-DINITROTOLUENE | UG/G : | 0.41K |
| ~~300~~ | ~~3-NITROANILINE~~ | UG/G : | 0.41K |
| 05 | ACENAPHTHENE | UG/G : | 14 |
| 16 | 2,4-DINITROPHENOL | UG/G : | 2.3K# |
| 46 | 4-NITROPHENOL | UG/G : | 0.41K |
| 02 | DIBENZOFURAN | UG/G : | 8.4 |
| 611 | 2,4-DINITROTOLUENE | UG/G : | 0.41K |
| 336 | DIETHYLPHTHALATE | UG/G : | 0.41K |
| 641 | 4-CHLOROPHENYL PHENYL ETHER | UG/G : | 0.41K |
| 381 | FLUORENE | UG/G : | 26 |
| 00 | 4-NITROANILINE | UG/G : | 0.41K |
| 00 | 4,6-DINITRO-2-METHYLPHENOL | UG/G : | 0.69K# |
| 636 | 4-BROMOPHENYL PHENYL ETHER | UG/G : | 0.41K |
| 00 | HEXACHLOROBENZENE | UG/G : | 0.41K |
| 032 | PENTACHLOROPHENOL | UG/G : | 0.41K |
| 461 | PHENANTHRENE | UG/G : | 130 |
| 20 | ANTHRACENE | UG/G : | 14 |
| 110 | DI-N-BUTYLPHTHALATE | UG/G : | 0.41K |
| 76 | FLUORANTHENE | UG/G : | 17 |
| 69 | PYRENE | UG/G : | 150# |
| 292 | BUTYL BENZYL PHTHALATE | UG/G : | 0.41K |
| 31 | 3,3'-DICHLOROBENZIDINE | UG/G : | 0.41K |
| 626 | BENZO(A)ANTHRACENE | UG/G : | 89 |
| 320 | CHRYSENE | UG/G : | 140 |
| 00 | BIS(2-ETHYLHEXYL)PHTHALATE | UG/G : | 0.41K |
| 596 | DI-N-OCTYLPHTHALATE | UG/G : | 0.41K |
| 230 | BENZO(B)FLUORANTHENE | UG/G : | 23 |
| 42 | BENZO(K)FLUORANTHENE | UG/G : | 0.41K |
| 247 | BENZO(A)PYRENE | UG/G : | 48 |
| 03 | INDENO(1,2,3-CD)PYRENE | UG/G : | 5.1# |
| 56 | DIBENZO(AH)ANTHRACENE | UG/G : | 7.9# |
| 521 | BENZO(GHI)PERYLENE | UG/G : | 17# |

ACCEPTABLE QUALITY CONTROL COULD NOT BE
OBTAINED FOR THIS ANALYTE.

ACCEPTABLE QUALITY CONTROL COULD NOT BE
TAINED FOR THIS ANALYSIS POSSIBLY DUE TO
TRIX EFFECT.

X202

E NUMBER : 0103813

HIS SAMPLE WAS ANALYZED AFTER THE 30 DAY
OLDING PERIOD.

| | | |
|---|---|---|
| 18 | CHLOROMETHANE | UG/G : 10K |
| 13 | BROMOMETHANE | UG/G : 100K |
| 75 | VINYL CHLORIDE | UG/G : 10K |
| 11 | CHLOROETHANE | UG/G : 10K |
| 23 | METHYLENE CHLORIDE | UG/G : 10K |
| 52 | ACETONE | UG/G : 52K |
| 83 | TRICHLOROFLUOROMETHANE | UG/G : 10K |
| 77 | BROMOCHLOROMETHANE | UG/G : 10K |
| 41 | CARBON DISULFIDE | UG/G : 10K |
| 01 | 1,1-DICHLOROETHYLENE | UG/G : 10K |
| 96 | 1,1-DICHLOROETHANE | UG/G : 10K |
| 46 | TRANS-1,2-DICHLOROETHYLENE | UG/G : 10K |
| 93 | CIS-1,2-DICHLOROETHYLENE | UG/G : 10K |
| 06 | CHLOROFORM | UG/G : 10K |
| 31 | 1,2-DICHLOROETHANE | UG/G : 10K |
| 95 | 2-BUTANONE(MEK) | UG/G : 52K |
| 06 | 1,1,1-TRICHLOROETHANE | UG/G : 10K |
| 02 | CARBON TETRACHLORIDE | UG/G : 10K |
| 91 | METHYL TERT BUTYL ETHER | UG/G : 10K |
| 01 | DICHLOROBROMOMETHANE | UG/G : 10K |
| 41 | 1,2-DICHLOROPROPANE | UG/G : 10K |
| 04 | CIS-1,3-DICHLOROPROPENE | UG/G : 10K |
| 80 | TRICHLOROETHYLENE | UG/G : 10K |
| 05 | CHLORODIBROMOMETHANE | UG/G : 10K |
| 11 | 1,1,2-TRICHLOROETHANE | UG/G : 10K |
| 24 | BENZENE | UG/G : 36 |
| 99 | TRANS-1,3-DICHLOROPROPENE | UG/G : 10K |
| 76 | 2-CHLOROETHYLVINYL ETHER | UG/G : 10K |
| 04 | BROMOFORM | UG/G : 26K |
| 33 | 4-METHYL-2-PENTANONE(MIBK) | UG/G : 10K |
| 03 | 2-HEXANONE(MBK) | UG/G : 10K |
| 75 | TETRACHLOROETHYLENE | UG/G : 10K |
| 16 | 1,1,2,2-TETRACHLOROETHANE | UG/G : 10K |
| 51 | TOLUENE | UG/G : 150 |
| 01 | CHLOROBENZENE | UG/G : 10K |
| 13 | ETHYLBENZENE | UG/G : 140 |
| 28 | STYRENE | UG/G : 10K |
| 51 | XYLENE | UG/G : 800 |

SOPROPYLBENZENE UG/G : 47

X202

E NUMBER : 0103315

CCEPTABLE QUALITY CONTROL COULD
OT BE OBTAINED FOR
PCB ANALYSIS.

SW-846 METHOD 8260 QUALITY CONTROL CRITERIA
AS NOT MET FOR THIS SAMPLE.

NO TCLP COMPOUND ABOVE REGULATORY LIMITS
ETECTED IN VOLATILE AND SEMIVOLATILE
NALYSIS.

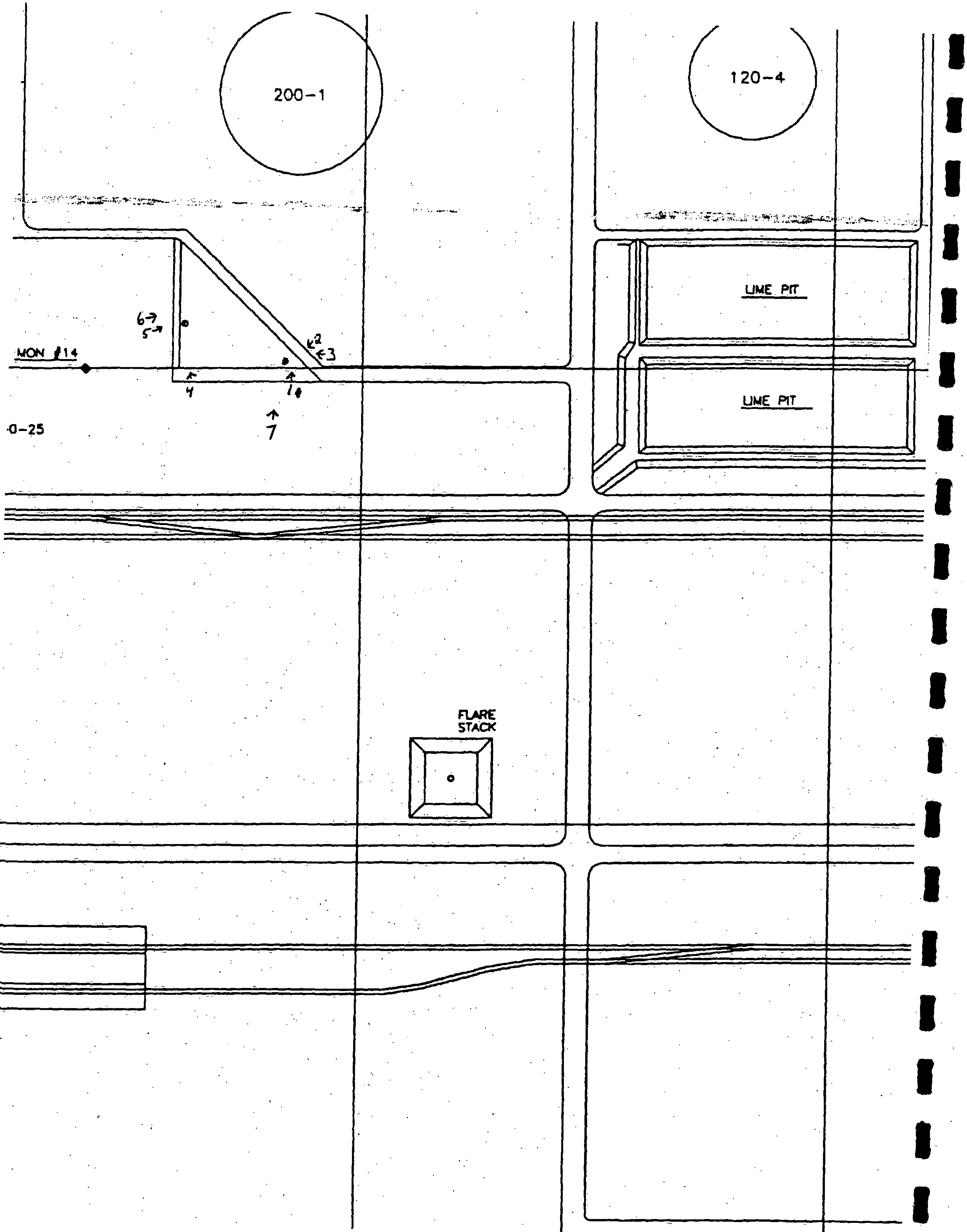
OTAL NON-TARGET COMPOUNDS UG/G; 10000
NON-TARGET COMPOUNDS INCLUDE;
ISC. PNAS
ISC. INDENES

4-SUBSTITUTED BENZENES
3-SUBSTITUTED BENZENES
LIPHATIC HYDROCARBONS
MISC. ORGANIC COMPOUNDS

ESULTS OF PAINT FILTER TEST SHOW NO FREE
IQUIDS PRESENT.

CMC

X202



200-1
120-4
LIME PIT
LIME PIT
MON #14
6
5
2
3
4
1
7
0-25
FLARE STACK

1190500002 – Madison County
Premcor Refining Group
FOS

## DIGITAL PHOTOGRAPH PHOTOCOPIES

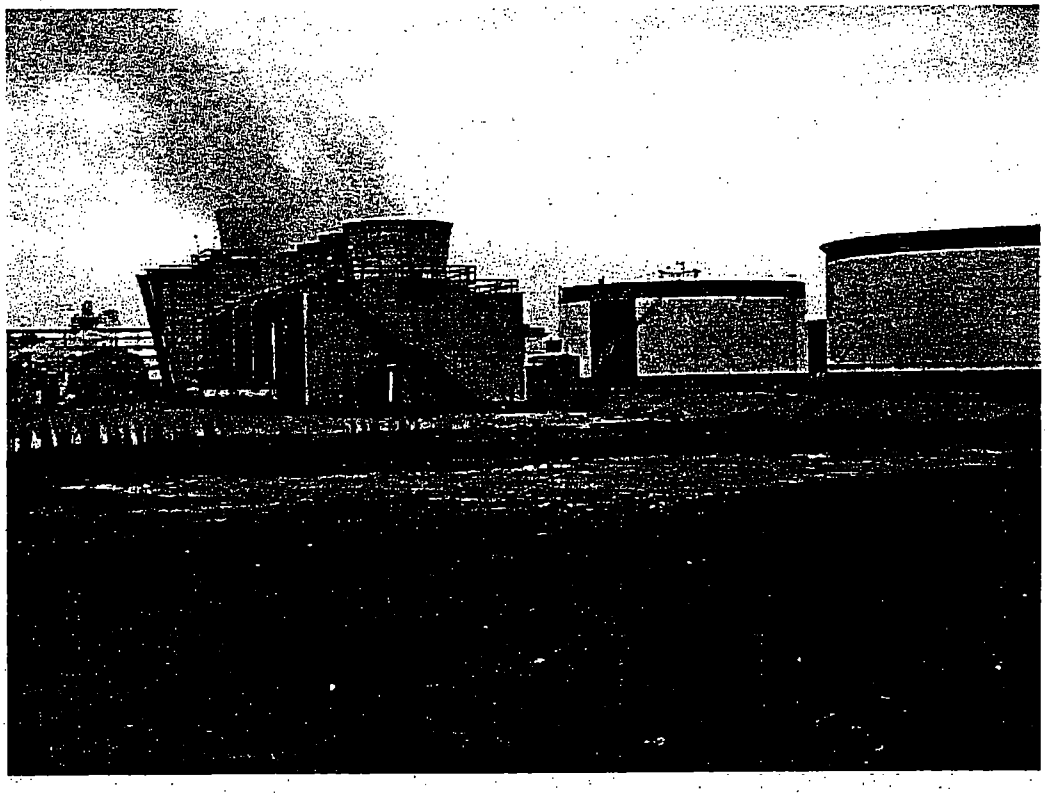
**Date: April 10, 2001**
**Time: 10:00-12:00**
**Direction: North**
**Photo by: Chris Cahnovsky**
**Photo Number:**
**1190500002~04102001-001**

**Date: April 10, 2001**
**Time: 10:00-12:00**
**Direction: Southwest**
**Photo by: Chris Cahnovsky**
**Photo Number:**
**1190500002~04102001-002**

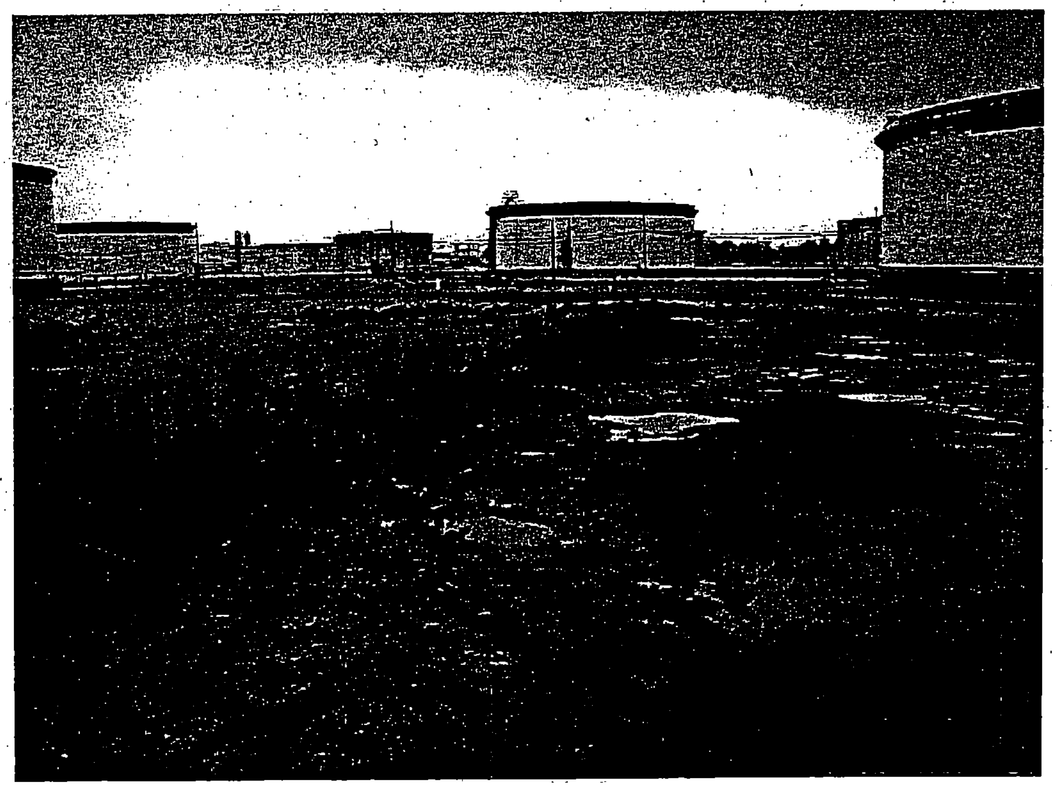
1190500002 – Madison County
Premcor Refining Group
FOS

## DIGITAL PHOTOGRAPH PHOTOCOPIES

**Date:** April 10, 2001
**Time:** 10:00-12:00
**Direction:** Southwest
**Photo by:** Chris Cahnovsky
**Photo Number:**
1190500002~04102001-003



**Date:** April 10, 2001
**Time:** 10:00-12:00
**Direction:** North
**Photo by:** Chris Cahnovsky
**Photo Number:**
1190500002~04102001-004



1190500002 – Madison County
Premcor Refining Group
FOS

# DIGITAL PHOTOGRAPH PHOTOCOPIES

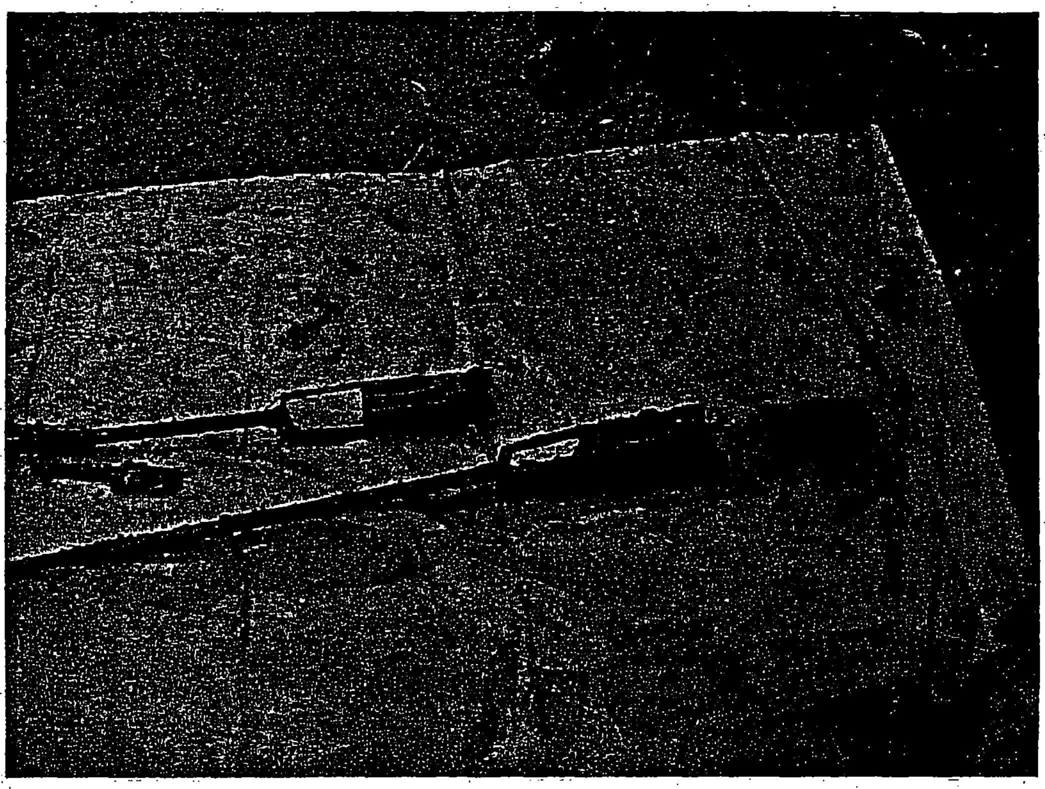
**Date:** April 10, 2001
**Time:** 10:00-12:00
**Direction:** East
**Photo by:** Chris Cahnovsky
**Photo Number:**
1190500002~04102001-005

**Date:** April 10, 2001
**Time:** 10:00-12:00
**Direction:** East
**Photo by:** Chris Cahnovsky
**Photo Number:**
1190500002~04102001-006

1190500002 – Madison County
Premcor Refining Group
FOS

## DIGITAL PHOTOGRAPH PHOTOCOPIES

**Date:** April 10, 2001
**Time:** 10:00-12:00
**Direction:** North
**Photo by:** Chris Cahnovsky
**Photo Number:**
1190500002~04102001-007



# APPENDIX P-15

## BULK STORAGE TANKS NORTH HISTORICAL INFORMATION

# Clark Refining & Marketing, Inc.

St. Louis, Missouri

Environmental Due Diligence Evaluation and Liability Cost Estimates Relative to Clark Facilities: Refineries, Terminals, Gasoline Stations, and Pipeline

**ENSR Consulting and Engineering**

**December 1994**

**Document Number 1684-004-150**

# CONTENTS

## CONTENTS
(Cont'd)

# CONTENTS
(Cont'd)

Storage or Disposal (TSD) facility. If such a permit was required, the Hartford Refinery would be subject to costly corrective actions at all solid and hazardous waste management units. Based on our 1990 inspection, the following areas were identified as representing principal areas of concern:

- Earthen stormwater ditches;
- Guard Pond;
- Duck Pond;
- Stormwater overflow area; and
- Bermed areas around storage tanks.

All of these areas appeared to contain significant, visible oil contamination as well as material which could be defined as hazardous waste. While we considered potential RCRA permitting, closure and corrective action as a major cost exposure to the refinery, there was no clear indication of the timing of any such action. The Hartford Refinery had been operating as a generator only and there was no evidence that the IEPA or the USEPA was planning to contest that status in the near future.

Of a more immediate concern were the costs associated with managing wastes which could be classified as hazardous based on the toxicity characteristic (TC), because of the then-recently promulgated Toxicity Characteristic Leaching Procedure (TCLP). The new RCRA hazardous waste characteristic rule would significantly increase the volume and therefore the cost of hazardous waste management at the Hartford Refinery.

The TCLP regulations, promulgated on March 29, 1990, reclassified many solid wastes to characteristic hazardous wastes. At the time of ENSR's 1990 study, the refinery was performing TCLP analyses on selected wastes in an effort to identify TC hazardous waste. The new regulations required that TC waste be managed by September 1990 as hazardous waste by large quantity generators. The wastes of particular concern at the refinery were as follows:

| Potential TC Hazardous Waste | Required Action if TC Hazardous |
|---|---|
| 1. Tank water bottoms | • Collect and treat in existing wastewater treatment system |

| | |
|---|---|
| 2. Contaminated soil in bermed areas of storage tanks | • Excavate and dispose<br>• Install facilities to prevent future contamination |
| 3. Contaminated soil in stormwater ditches | • Excavate and dispose<br>• Install sewer system |
| 4. Contaminated sludge within the Guard/Duck ponds | • Close and/or replace with treatment/storage tanks |
| 5. Guard Pond sludge disposal area | • Close |

ENSR believed that when Clark addressed the issues associated with proper management of the wastes listed above, compliance with the TCLP regulations represented a significant compliance and potential major cost liability to the refinery.

Based upon the 1990 assessment, current costs at the Hartford Refinery for management of hazardous wastes were nominal, but new regulations and the potential for agency enforcement of new regulations would likely substantially increase these costs over the next several years, particularly in terms of addressing the five waste management issues listed earlier. Significant increases in the volume of hazardous waste were expected as a result of the new TCLP regulations. Major capital improvements for new methods of handling hazardous waste were also expected in order to comply with the TCLP rules and possibly agency enforcement of existing RCRA regulations. Due to the absence of TCLP test data on actual waste, ENSR was not able to accurately estimate the relative magnitude of these increased costs. It was reported to ENSR by Clark that TCLP testing had been conducted on the waste streams that were being generated and that the overall financial impact of these TCLP results would be minimal.

Other issues and changes in 1990 at the Hartford Refinery were noted as follows:

- Water Quality: The 1990 study indicated that the Hartford Refinery's NPDES permit for discharge of treated wastewater to the Mississippi River expires February 29, 1993. During the first seven months of 1990, the refinery had exceeded its permit limits 11 times. The exceedances were primarily (7 of 11 exceedances) attributable to a single upset which occurred in February, 1990. This frequency of minor exceedances is typical of most industrial NPDES permits and did not represent a major concern. It appeared that there were no outstanding or unresolved regulatory issues of significance concerning water quality matters at the Hartford Refinery based upon our 1990 assessment.

elimination of the open ditches, cleaning of the Guard Basin, and the separation of the process wastes from stormwater (i.e., no dry flow to the stormwater system and Guard Basin) have removed these areas/units from potential regulation as a hazardous waste TSDF and, in ENSR's opinion, has significantly lowered the probability of the need for the refinery to obtain a RCRA permit. However, this does not entirely eliminate possible future RCRA permit requirements, in our opinion.

The past operating and waste management practices at the Hartford Refinery have created other solid waste management units which may contain hazardous wastes (either listed or characteristic) that may be considered hazardous waste disposal sites. Such areas may include:

- Duck Pond,
- Stormwater Overflow area,
- Guard Pond Sludge Disposal area,
- Crude Tank Sludge Disposal area, and
- Storage Tank Containment areas.

Each of these areas, based upon past operating and waste management practices, may have received hazardous wastes in the past, in ENSR's opinion. This situation could require Clark to comply with RCRA closure and post-closure requirements, including facility wide corrective action for all solid waste management units.

In November 1990, the IEPA representing USEPA performed a RCRA Facility Assessment (RFA) (the first step in the Corrective Action process to determine whether their has been releases of hazardous wastes or hazardous constituents) at the Hartford Refinery. Soil and groundwater samples were taken at various locations throughout the refinery to determine the presence of hazardous constituents. The results (conclusions) of this RFA have not been made available and it is believed that the situation has low priority within IEPA. While we continue to consider potential RCRA permitting and Corrective Action a potential major cost exposure, there is, as in the past, no clear indication of the timing of any such action. Our assessment, based on our 1994 evaluation, is that although the potential exists, there is a much lower probability for the agencies to bring the Hartford Refinery into the RCRA permitting universe. Based upon our recent site visit, the refinery is currently a generator only and there is no evidence that the IEPA or the USEPA will contest this status now or in the future.

Results of Current (1994) Study

Unlike the situation observed during our 1990 site visit, there had been several significant actions taken by the Hartford Refinery regarding the areas of on-site contamination that had been identified in our previous studies. The nine areas of on-site contamination previously identified are listed below along with a brief summary of actions (or no actions) taken by Clark since 1990.

- Slop Oil Storage and Treatment Tank Area: As discussed in the summary of the 1990 study and observed in our most recent site visit, the refinery has modified its "slop oil" storage and recycling system. This has resulted in improved housekeeping especially within the area of the wastewater treatment plant (generally resulting from the new enclosed equalization tanks which replaced the old API separator, enclosing the old forebag and DAF unit, and construction of a containment dike around #4 Agitator tank). However, the areas within the containment berms of the slop oil (recycle oil) interim storage tanks (R-16, R-13, 10-1, 10-6, and generally most of the 10's Tank Farm area) are heavily stained with oily material which do not appear to have been addressed since our 1990 site visit.

- Guard Pond and Associated Stormwater/Oily Water Overflow Area: As discussed earlier, the Guard Pond (along with the open ditch system within the refinery) has been "cleaned" under the IEPA's voluntary closure program. This is a major improvement at the refinery. However, based upon our recent site visit, the stormwater/oily water overflow areas have not been addressed.

- The Duck Pond: The Duck Pond is adjacent to the Guard Pond and is of similar size. However, refinery personnel have maintained that the Duck Pond has always been a separate unit and has not received stormwater/process wastewater flow in the past as did the Guard Pond. However, based upon ENSR's previous studies and observations there is a significant probability that the Duck Pond did receive process wastewater flow in the past either directly or as overflow from the Guard Pond. Our opinion has not changed, based upon our recent site visit.

- Guard Pond Sludge Disposal Area: This is an area, adjacent to the Guard Pond, where sludge from past dredging of the Guard Pond has been placed. No action has been taken nor, according to refinery personnel, is any action planned relative to addressing this area. "It is to be left in-place", according to refinery personnel.

- Lime Pits: These pits were used primarily in the past to store dewatered lime sludge generated from the refinery boilers. Periodically, the lime sludge was removed from the pits and disposed of in an area behind the old Asphalt Plant on the refinery's "south" property. During our recent site visit, refinery personnel indicated that the contents of the pits had been analyzed and were shown to be non-hazardous. In addition, six (6) monitoring wells were installed in 1993 around the pits and reportedly no contaminated groundwater was found in the area downgradient of the pits.

- Lime Sludge Disposal Area: This is an area, mentioned above, which was used in the past for the disposal of lime sludge. Previous ENSR studies indicated that this area may have been used occasionally for disposal of other refinery wastes. However, this area has been sampled and showed "no constituents of concern," according to refinery personnel.

- Crude Oil Tank Bottoms Disposal Area (Sludge Pit): This is a small diked area which in the past was reportedly used for the disposal of tank bottom sludges. According to refinery personnel, the area has been sampled, and tested non-hazardous and nothing more is planned.

- Tank Farm Containment Areas and Berms: Like most petroleum refineries, past tank bottoms and water drains from crude and product storage tanks were spread on the containment berms and discharged within the containment areas and allowed to seep into the ground, respectively. In addition, there have been spills, both major and minor, within a number of containment areas which have accumulated over the years, resulting in potentially significant surface contamination by oily materials. Based upon our recent site visit, a program has been in place to address oily waste and soils within the tank farm containment areas. According to Bill Irwin, this consists of removal of areas where oily materials have saturated the soil and a program of applying bio-sludge (from the refinery's biological treatment unit) to areas where oily material/soil are visible within the tank farm containment areas. This program of bio-degradation of oily soil has only recently begun such that results have not yet been established. However, there are plans to continue this program over the long term with periodic monitoring, and minimal maintenance.

- Emergency Wastewater Treatment Ponds: In the past, several large impoundment areas located adjacent to the Mississippi River were used for emergency overflow from the wastewater treatment system either in heavy rainy periods or when the treatment system malfunctioned. Because these impoundments may have contained partially treated or untreated wastewaters in the past, ENSR's initial studies were concerned with potential residual contamination in these impoundment areas. According to our recent study, these impoundments have not been utilized for the last 10 years; and, no future action is planned to address them.

Based upon the above, the Hartford Refinery has addressed and eliminated several major on-site contamination concerns which were previously identified: the Guard Pond and open drainage ditches. In addition, since our 1990 study, the refinery has reportedly sampled several of the other areas identified as being suspect in our 1990 study and found the materials to be non-hazardous waste. Additionally, the refinery has initiated a long-term program to address the oily waste contamination within the tank farm containment areas. These activities have significantly reduced the on-site contamination concerns and associated potential liabilities and should continue to reduce them as the Hartford Refinery furthers its efforts to address these issues. However, areas remain, as identified above, which have not been addressed or where there are no activities planned, such as the Guard Pond Sludge Disposal Area, the Stormwater/Oily Water Overflow Area and Duck Pond, along with the tank farm containment areas. Of these areas, only the Duck Pond and possibly the tank farm containment area would have costs associated with its cleanup which, if or when required, would involve an expenditure in excess of $2 million, in our opinion.

In addition to the nine areas of potential surface soil contamination discussed earlier, there is the continuing issue of subsurface gasoline-product contamination beneath the refinery and its off-site migration to the northwest beneath the Village of Hartford. The Hartford Refinery continues to abstract gasoline from recovery wells located both on the refinery property and from several sites in the Village of Hartford. Since ENSR's 1990 study, the refinery has implemented several improvements to the gasoline recovery program. An extensive vapor recovery system (VRS) was installed within the Village of Hartford in order to increase gasoline recovery, reduce gasoline vapors in the soil, and minimize or eliminate vapors from migrating into basements of houses. In conjunction with the VRS, the Hartford Refinery installed and is operating a thermal treatment unit on-site in order to treat vapors recovered from the VRS. Reportedly, the VRS and thermal treatment unit have improved the recovery of gasoline and reduced soil vapors in the Village of Hartford. Since they have installed the VRS, there have been fewer complaints from residents and Clark is recovering an average of 400 barrels per month of gasoline, according to refinery personnel.

Near future (1995) activities planned by the Hartford Refinery include the installation of a second vapor recovery system (estimated at $450,000) and installation of additional liquid extraction and

APPENDIX Q

# APPENDIX Q

# APPENDIX Q

## DOCUMENTS RELATED TO THE BULK STORAGE TANKS SOUTH AREA

# APPENDIX Q-1

## OIL POLLUTION ACT OF 1990 REPSONSE PLAN FOR PREMCOR

Premcor
Hartford Refinery
*"Partners in the Community"*

# OIL POLLUTION ACT OF 1990 RESPONSE PLAN for The Premcor Refining Group, Inc. Hartford Refinery

**Volume 1 of 2**

**May 1998**
**(Name revision September 2002)**


**Burns & McDonnell Engineering Company, Inc.**
**Engineers-Geologists-Scientists**
**Fenton, Missouri**

DATE OF LAST UPDATE: 5/98

# RESPONSE PLAN COVER SHEET

Owner/Operator of the Facility: The Premcor Refining Group, Inc.

Facility Name: The Premcor Refining Group, Inc. Hartford Terminal

Facility Address: 201 E. Hawthorne, Hartford, Illinois 62048

Latitude: 38E 50'

Longitude: 90E 06'

Facility Telephone Number: (618) 254-7301

Largest Tank Capacity: 8,400,00 gallons

Facility Maximum Storage Capacity: 137,309,809 gallons

Number of Petroleum Product Storage Tanks: 73

Dun & Bradstreet Number: 199623414

Standard Industrial Classification (SIC): 2911

Worst-Case Discharge Amount: 8,400,000 gallons (5,020,000 gallons = maximum fill capacity)

Facility Distance to Navigable Water: approximately 1 mile (Mississippi River)

**Substantial Harm Criteria**

Does the facility transfer oil over-water to or from vessels and does the facility have a total oil storage capacity greater than or equal to 42,000 gallons? **YES for barge terminal only**

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and within any storage area does the facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation? **NO**

Does the facility have a total oil storage capacity greater than or equal to 1 million gallons and is the facility located at a distance such that a discharge from the facility could cause injury to fish and wildlife and sensitive environments? **YES**

# HAZARD IDENTIFICATION
# ABOVEGROUND BULK OIL STORAGE TANKS

| TANK NUMBER | SUBSTANCE STORED | AVERAGE QUANTITY STORED (GALLONS) | TANK TYPE | YEAR INSTALLED | MAXIMUM CAPACITY (GAL) | OIL CLASSIFICATION GROUP |
|---|---|---|---|---|---|---|
| 1-1 | Sweet Naptha | 0 | Steel, FR | 1961 | 42,000 | II |
| T-1-18 | Waste Oil | 10,000 | Steel | 1989 | 31,500 | III |
| 3-1 | Light Cycle Oil | 56,406 | Steel, CR | 1956 | 126,000 | III |
| 5-2 | Light Cycle Oil | 71,221 | Steel, CR | 1941 | 210,000 | III |
| 5-9 | Road Oil | 93,061 | Steel, CR | 1954 | 215,880 | III |
| 5-10 | Treated Oil | 72,450 | Steel, CR | 1954 | 215,880 | III |
| 10-3 | Slop Oil | 370,209 | Steel, CR | 1941 | 420,000 | III |
| 10-5 | Xylene | 181,786 | Steel, CR | 1941 | 420,000 | II |
| 10-6 | Slop Oil | 232,207 | Steel, CR | 1941 | 420,000 | III |
| 10-7 | Xylene | 200,140 | Steel, CR | 1941 | 420,000 | II |
| 10-8 | #6 Fuel Oil | 110,712 | Steel, CR | 1941 | 420,000 | III |
| 10-10 | Light Cycle Oil | 368,109 | Steel, CR | 1941 | 420,000 | III |

CR - Cone Roof
FR - Floating Roof

# HAZARD IDENTIFICATION
## ABOVEGROUND BULK OIL STORAGE TANKS

| TANK NUMBER | SUBSTANCE STORED | AVERAGE QUANTITY STORED (GALLONS) | TANK TYPE | YEAR INSTALLED | MAXIMUM CAPACITY (GAL) | OIL CLASSIFICATION GROUP |
|---|---|---|---|---|---|---|
| 10-16 | Slop Oil | 234,265 | Steel, CR | 1954 | 428,400 | III |
| 10-17 | Slop Oil | 199,101 | Steel, CR | 1954 | 428,400 | III |
| 10-20 | Sweet Naptha | 307,471 | Steel, CR | 1961 | 420,000 | II |
| 10-21 | Sweet Tip Feed | 304,731 | Steel, CR | 1962 | 420,000 | II |
| 20-2 | Coker Naptha | 186,914 | Steel, CR | 1948 | 840,000 | II |
| 20-3 | Coker Naptha | 113,582 | Steel, CR | 1948 | 840,000 | II |
| 20-8 | Alkylate | 114,664 | Steel, FR | 1960 | 840,000 | II |
| 35-1 | Premium Gasoline | 310,275 | Steel, FR | 1957 | 1,470,000 | II |
| 35-2 | Premium Gasoline | 262,642 | Steel, FR | 1957 | 1,470,000 | II |
| 35-3 | Sour Tip Feed | 810,993 | Steel, FR | 1960 | 1,470,000 | II |
| 55-1 | Gas Oil | 159,358 | Steel, CR | 1941 | 2,310,000 | III |
| 55-2 | Light Cycle Oil | 634,347 | Steel, CR | 1941 | 2,310,000 | IV |
| 55-3 | #2 Fuel Oil | 1,130,430 | Steel, CR | 1941 | 2,310,000 | III |

CR - Cone Roof
FR - Floating Roof

# HAZARD IDENTIFICATION
# ABOVEGROUND BULK OIL STORAGE TANKS

| TANK NUMBER | SUBSTANCE STORED | AVERAGE QUANTITY STORED (GALLONS) | TANK TYPE | YEAR INSTALLED | MAXIMUM CAPACITY (GAL) | OIL CLASSIFICATION GROUP |
|---|---|---|---|---|---|---|
| 80-1 | Asphalt | 1,407,266 | Steel, CR | 1941 | 3,360,000 | V |
| 80-2 | Asphalt | 1,119,573 | Steel, CR | 1941 | 3,360,000 | V |
| 80-3 | Asphalt | 2,274,888 | Steel, CR | 1941 | 3,360,000 | V |
| 80-4 | Full Range Oil | 751,054 | Steel, FR | 1945 | 3,360,000 | II |
| 80-5 | Gasoline | 1,015,630 | Steel, FR | 1949 | 3,360,000 | II |
| 80-6 | #1 Fuel Oil | 1,108,201 | Steel, FR | 1949 | 3,360,000 | II |
| 80-9 | Slurry | 1,636,026 | Steel, CR | 1952 | 3,360,000 | V |
| 80-10 | Diesel | 854,227 | Steel, CR | 1952 | 3,360,000 | III |
| 80-11 | Gasoline | 1,415,372 | Steel, FR | 1953 | 3,360,000 | II |
| 120-1 | Crude Oil | 3,093,919 | Steel, FR | 1947 | 5,040,000 | III |
| 120-2 | Crude Oil | 883,281 | Steel, FR | 1947 | 5,040,000 | III |
| 120-3 | Crude Oil | 1,291,836 | Steel, FR | 1953 | 5,040,000 | III |
| 120-4 | Gasoline | 3,575,890 | Steel, FR | 1953 | 5,040,000 | II |
| 120-5 | Gasoline | 2,358,692 | Steel, FR | 1953 | 5,040,000 | II |
| 120-6 | #6 Fuel Oil | 4,005,918 | Steel, FR | 1953 | 5,040,000 | IV |

CR - Cone Roof
FR - Floating Roof

DATE OF LAST UPDATE 5/98

# HAZARD IDENTIFICATION
# ABOVEGROUND BULK OIL STORAGE TANKS

| TANK NUMBER | SUBSTANCE STORED | AVERAGE QUANTITY STORED (GALLONS) | TANK TYPE | YEAR INSTALLED | MAXIMUM CAPACITY (GAL) | OIL CLASSIFICATION GROUP |
|---|---|---|---|---|---|---|
| 120-9 | Natural Gas | 1,423,644 | Steel, CR | 1975 | 5,040,000 | II |
| 200-1 | Crude Oil | 5,018,244 | Steel, FR | 1975 | 8,400,000 | III |
| R-17 | Slop Oil | 47,743 | Steel, CR | 1946 | 94,500 | III |
| R-18 | Slop Oil | 29,998 | Steel, CR | 1946 | 94,500 | III |
| 1 | Unleaded Gasoline | 998,729 | Steel, CR | 1974 | 1,722,000 | II |
| 2 | Premium Unleaded Gasoline | 1,569,303 | Steel, CR | 1974 | 4,242,000 | II |
| 3 | #2 Fuel Oil | 4,205,446 | Steel, CR | 1974 | 6,930,000 | III |
| 4 | #2 Fuel Oil | 1,401,815 | Steel, CR | 1974 | 6,930,000 | III |
| 5 | Unleaded Gasoline | 1,884,889 | Steel, CR | 1974 | 4,242,000 | II |
| 7 | Ethanol | 109,547 | Steel, FR | 1985 | 45,360 | II |
| 8 | Nalco | 5,140 | Steel, FR | 1990 | 9,994 | II |
| 120-7 | Gas Oil | 2,068,836 | Steel, FR | 1957 | 5,040,000 | III |
| 120-8 | Naptha | 1,361,688 | Steel, FR | 1957 | 5,040,000 | II |

CR - Cone Roof
FR - Floating Roof

DATE OF LAST UPDATE 5/98

# HAZARD IDENTIFICATION
# ABOVEGROUND BULK OIL STORAGE TANKS

| TANK NUMBER | SUBSTANCE STORED | AVERAGE QUANTITY STORED (GALLONS) | TANK TYPE | YEAR INSTALLED | MAXIMUM CAPACITY (GAL) | OIL CLASSIFICATION GROUP |
|---|---|---|---|---|---|---|
| 120-10 | Gas Oil | 2,261,038 | Steel. FR | 1975 | 5,040,000 | III |
| 120-11 | #2 Stripper | 1,638,360 | Steel, FR | 1975 | 5,040,000 | II |
| A-2 | Slop Oil | 20,000 | Steel, HD | 1941 | 25,788 | III |
| A-11 | Slop Oil | 19,301 | Steel, CR | 1946 | 94,500 | III |
| A-12 | Slop Oil | 24,433 | Steel, CR | 1941 | 105,000 | III |
| A-13 | Slop Oil | 23,092 | Steel, CR | 1941 | 105,000 | III |
| A-14 | Slop Oil | 5,371 | Steel, CR | 1949 | 64,596 | III |
| A-15 | Slop Oil | 4,241 | Steel, CR | 1950 | 64,596 | III |
| A-18 | Slop Oil | 40,246 | Steel, CR | 1954 | 110,040 | III |
| A-19 | Slop Oil | 49,675 | Steel, CR | 1954 | 110,040 | III |
| A-20 | Slop Oil | 60,091 | Steel, CR | 1954 | 110,040 | III |
| A-21 | Slop Oil | 44,845 | Steel, CR | 1954 | 110,040 | III |
| A-22 | Slop Oil | 59,514 | Steel, CR | 1954 | 110,040 | III |

CR - Cone Roof
FR - Floating Roof
HD - Horizontal Drum

# HAZARD IDENTIFICATION
# ABOVEGROUND BULK OIL STORAGE TANKS

| TANK NUMBER | SUBSTANCE STORED | AVERAGE QUANTITY STORED (GALLONS) | TANK TYPE | YEAR INSTALLED | MAXIMUM CAPACITY (GAL) | OIL CLASSIFICATION GROUP |
|---|---|---|---|---|---|---|
| T-57 | #2 Oil Distillate | 30,000 | Steel, CR | 1963 | 55,000 | III |
| T-145 | #2 Oil Distillate | 25,000 | Steel, CR | 1982 | 61,073 | III |
| T-56 | #2 Oil Distillate | 12,000 | Steel, CR | 1963 | 42,000 | III |
| T-55 | #2 Oil Distillate | 7,000 | Steel, CR | 1963 | 15,750 | III |
| T-72 | Gasoline | 32,000 | Steel, CR | 1963 | 65,776 | II |
| T-171 | DAF Floc | 18,000 | Steel, CR | 1995 | 20,000 | III |
| PV-1007 | Waste Oil | 5,000 | Steel Vessel | 1979 | 16,116 | III |

CR - Cone Roof
FR - Floating Roof

DATE OF LAST UPDATE 5/98

# HAZARD IDENITIFICATION
# UNDERGROUND BULK OIL STORAGE TANKS

| TANK NUMBER | SUBSTANCE STORED | AVERAGE QUANTITY STORED (GALLONS) | TANK TYPE | YEAR INSTALLED | MAXIMUM CAPACITY (GAL) | OIL CLASSIFICATION GROUP |
|---|---|---|---|---|---|---|
| 1 | Slop Oil | 1,000 | Steel | 1974 | 2,000 | III |
| 2 | Slop Oil | 1,000 | Steel | 1974 | 2,000 | III |

DATE OF LAST UPDATE 5/98

# ABOVEGROUND BULK OIL STORAGE TANKS
# SECONDARY CONTAINMENT

| TANK NUMBER | SUBSTANCE STORED | MAXIMUM CAPACITY (GAL) | SECONDARY CONTAINMENT CAPACITY (GAL) |
|---|---|---|---|
| 1-1 | Sweet Naptha | 42,000 | 924,000 |
| 5-10 | Treated Oil | 215,880 | |
| 10-20 | Sweet Naptha | 420,000 | |
| 20-8 | Alkylate | 840,000 | |
| T-1-18 | Waste Oil | 31,500 | 34,650 |
| T-3-1 | Light Cycle Oil | 125,000 | 137,500 |
| 5-2 | Light Cycle Oil | 21,000 | 231,000 |
| 5-9 | Road Oil | 215,880 | 471,240 |
| 10-16 | Slop Oil | 428,400 | |
| 10-17 | Slop Oil | 428,400 | |
| A-11 | Slop Oil | 94,500 | |
| A-12 | Slop Oil | 105,000 | |
| A-13 | Slop Oil | 105,000 | |
| A-14 | Slop Oil | 64,596 | |
| A-15 | Slop Oil | 64,596 | |
| A-18 | Slop Oil | 110,040 | |
| A-19 | Slop Oil | 110,040 | |
| A-20 | Slop Oil | 110,040 | |
| A-21 | Slop Oil | 110,040 | |
| A-22 | Slop Oil | 110,040 | |
| 10-3 | Slop Oil | 420,000 | 462,000 |
| 10-5 | Xylene | 420,000 | 462,000 |
| 10-6 | Slop Oil | 420,000 | 462,000 |
| 10-8 | #6 Fuel Oil | 420,000 | |
| R-17 | Slop Oil | 94,500 | |
| R-18 | Slop Oil | 94,500 | |
| 10-7 | Xylene | 420,000 | 462,000 |
| 10-10 | Light Cycle Oil | 420,000 | 462,000 |
| 10-21 | Sweet Tip Feed | 420,000 | 462,000 |
| 20-2 | Coker Naptha | 840,000 | 924,000 |
| 20-3 | Coker Naptha | 840,000 | 924,000 |
| 35-1 | Premium Gasoline | 1,470,000 | 1,617,000 |
| 35-2 | Premium Gasoline | 1,470,000 | |
| 35-3 | Sour Tip Feed | 1,470,000 | 1,617,000 |

DATE OF LAST UPDATE 5/98

# ABOVEGROUND BULK OIL STORAGE TANKS SECONDARY CONTAINMENT

| TANK NUMBER | SUBSTANCE STORED | MAXIMUM CAPACITY (gal) | SECONDARY CONTAINMENT CAPACITY (gal) |
|---|---|---|---|
| 55-1<br>80-9 | Gas Oil<br>Slurry | 2,310,000<br>3,360,000 | 3,696,000 |
| 55-2 | Light Cycle Oil | 2,310,000 | 2,541,000 |
| 55-3<br>80-5<br>120-9 | #2 Fuel Oil<br>Gasoline<br>Natural Gas | 2,310,000<br>3,360,000<br>5,040,000 | 5,544,000 |
| 80-1 | Asphalt | 2,260,000 | 3,696,000 |
| 80-2<br>120-6 | Asphalt<br>#6 Fuel Oil | 3,360,000<br>5,040,000 | 5,544,000 |
| 80-3 | Asphalt | 3,360,000 | 3,696,000 |
| 80-4 | Full Range Oil | 3,360,000 | 3,696,000 |
| 80-6 | #1 Fuel Oil | 3,360,000 | 3,696,000 |
| 80-10<br>T-57<br>T-56<br>T-55 | Diesel<br>#2 Oil Distillate<br>#2 Oil Distillate<br>#2 Oil Distillate | 3,360,000<br>63,000<br>42,000<br>15,750 | 3,696,000 |
| 80-11 | Gasoline | 3,360,000 | 3,696,000 |
| 120-1 | Crude Oil | 5,040,000 | 5,544,000 |
| 120-2 | Crude Oil | 5,040,000 | 5,544,000 |
| 120-3 | Crude Oil | 5,040,000 | 5,544,000 |
| 120-4 | Gasoline | 5,040,000 | 5,544,000 |
| 120-5 | Gasoline | 5,040,000 | 5,544,000 |
| 200-1 | Crude Oil | 8,400,000 | 9,240,000 |
| 1 | Unleaded Gasoline | 1,722,000 | 1,894,200 |
| 2 | Premium Unleaded Gasoline | 4,242,000 | 4,666,200 |
| 3 | #2 Fuel Oil | 6,930,000 | 7,623,000 |
| 4 | #2 Fuel Oil | 6,930,000 | 7,623,000 |
| 5 | Unleaded Gasoline | 4,242,000 | 4,666,200 |

# ABOVEGROUND BULK STORAGE TANKS
# SECONDARY CONTAINMENT

| TANK NUMBER | SUBSTANCE STORED | MAXIMUM CAPACITY (gal) | SECONDARY CONTAINMENT CAPACITY (gal) |
|---|---|---|---|
| 7<br>8<br>120-8 | Ethanol<br>Nalco<br>Naptha | 45,360<br>9,994<br>5,040,000 | 5,544,000 |
| 120-7 | Gas Oil | 5,040,000 | 5,544,000 |
| 120-10 | Gas Oil | 5,040,000 | 5,544,000 |
| 120-11 | Naptha | 5,040,000 | 5,544,000 |
| A-2 | Slop Oil | 25,788 | 28,367 |
| T-145 | #2 Oil Distillate | 61,073 | 67,180 |
| T-171 | DAF Floc | 18,000 | 19,800 |
| PV-1007 | Waste Oil | 16,116 | 17,728 |
| T-72 | Gasoline | 65,776 | 72,354 |

NOTES: Storage tank secondary containments were designed to hold 100 percent of the volume of the largest tank contained within the containment area, plus 10 percent for moisture accumulation. Secondary containment volumes were calculated based upon the design specifications.

Clayton
GROUP SERVICES

# APPENDIX Q-2

## SUMMARY REPORT OF SPILLS
## NOVEMBER 1995

AREA H
ILLINOIS ENVIRONMENTAL PROTECTION
AGENCY SPILL NUMBER

941913, 942188

## SPILL #941913 - SIX INCH PUMP OUT LINE LEAK, HAWTHORNE AVENUE

### Incident Summary

This event was the result of a leak in the six-inch diameter Fluid Catalytic Cracking unit pump out line. Clark personnel noticed gasoil in the concrete pit and culvert on the north side of Hawthorne Avenue. Clark excavated on the south side of Hawthorne Avenue and found that a six-inch diameter unit line connected to Tank 120-7 was leaking. The total amount of material released was estimated to be approximately 3500 gallons. The released product, seeking the path of least resistance, accumulated in the concrete culvert located on the north side of Hawthorne Avenue. The majority of the material was recovered prior to excavating on the south side of the pipe conduit.

### Remediation Effort

Clark personnel utilized vacuum trucks to recover free product and water from the areas surrounding the release. Clark estimates approximately 12,400 gallons of product and water were recovered by this process. Recovered product was rerun through the process units, while recovered water was treated in the aggressive biological wastewater treatment process. Remediation of the soil and sampling in this area was completed in conjunction with remediation of Spill #942188.

## Spill #942188 - 10 Inch Suction Line Failure (FCC), Hawthorne Ave

### Incident Summary

On September 25, 1994, Clark had a release from their 10 inch suction line for the FCC unit while the line was being purged back to the charge tank for repair work. Approximately 1,700 barrels of gasoil was released from the concrete pit on the north side of Hawthorne Avenue and from the tunnel on the south side of Hawthorne Avenue (Area H). Figure 21 shows the location of Area H. Figure 22 shows the approximate release area in detail.

### Remediation Effort

Clark personnel utilized vacuum trucks to recover free product from the areas surrounding the release. Clark estimated approximately 1,400 barrels of product were recovered during the initial phase of the remediation. Soil was excavated to a depth ranging from approximately 6 inches to 1 foot along the north side of Hawthorne Avenue. The presence of a high pressure gas line located in the area prohibited excavation to greater depths. Soil was excavated from depths of approximately 8 inches to 6 feet on the south side of Hawthorne Avenue. Excavation depths near the tunnel were near 6 feet tapering to approximately 8 inches at the lateral extent of the spill area. Figure 23 shows the approximate extent of excavation at this site. Approximately 1,000 cubic yards of oil saturated soil was excavated and disposed of at special waste landfills. Copies of manifests are included at the end of this section.

Clark believes that the non-recoverable oil was removed with the excavated soil so that the entire quantity of spilled material (1700 barrels) has been removed from the site. Clark initiated a modified biological augmentation program to remediate the soil by applying activated sludge from the aggressive biological wastewater treatment process to the area after removing the contaminated soil. Soil samples were collected by Clark from the site on seven dates from September 29, 1994 through October 13, 1995 to determine levels of cleanup. Soil samples were analyzed for BTEX and PNAs. Figure 23 indicates the location of these samples. Table 7 summarizes the sampling results for the seven sampling events. A copy of laboratory analytical reports follows at the end of this section. Clark does not believe that groundwater at the facility was impacted by this event and plans no additional response for this area at this time.

## Table 7
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 9/29/94 | | 9/29/94 | | 9/29/94 | | 9/29/94 | | 9/29/94 | | 9/29/94 | | 9/29/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 20.0 | 90.8 | 4.0 | ND | 2.0 | ND | 10.0 | 42.1 | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 20.0 | 792.9 | 4.0 | 13.4 | 2.0 | ND | 10.0 | 354.2 | 4.0 | ND | 4.0 | ND | 4.0 | 4.0 |
| Ethylbenzene | µg/kg | 20.0 | 644.3 | 4.0 | 16.4 | 2.0 | ND | 10.0 | 195.1 | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 20.0 | 5127.0 | 4.0 | 106.7 | 2.0 | 10.9 | 10.0 | 1732.0 | 4.0 | 11.5 | 4.0 | ND | 4.0 | 17.7 |
| Total BTEX | µg/kg | 20.0 | 6655.0 | 4.0 | 136.5 | 2.0 | 10.9 | 10.0 | 2323.4 | 4.0 | 11.5 | 4.0 | ND | 4.0 | 21.7 |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 0.25 | 0.88 | 0.05 | 0.14 | 0.05 | 0.07 | 0.10 | 1.70 | 0.05 | 0.11 | 0.05 | 0.06 | 0.05 | ND |
| Acenapthhylene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | ND | 0.10 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Acenapthene | mg/kg | 0.25 | ND | 0.05 | 0.05 | 0.05 | ND | 0.10 | 0.54 | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Flourene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | ND | 0.10 | 0.47 | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Phenanthrene | mg/kg | 0.25 | 0.42 | 0.05 | 0.16 | 0.05 | 0.11 | 0.10 | 1.40 | 0.05 | 0.20 | 0.05 | 0.10 | 0.05 | ND |
| Anthracene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | ND | 0.10 | 0.32 | 0.05 | 0.08 | 0.05 | ND | 0.05 | ND |
| Flouranthene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | 0.08 | 0.10 | 0.22 | 0.05 | 0.13 | 0.05 | ND | 0.05 | ND |
| Pyrene | mg/kg | 0.25 | ND | 0.05 | 0.09 | 0.05 | 0.10 | 0.10 | 0.66 | 0.05 | 0.39 | 0.05 | 0.10 | 0.05 | ND |
| Benzo(a)anthracene | mg/kg | 0.20 | ND | 0.04 | 0.04 | 0.04 | ND | 0.08 | 0.26 | 0.04 | 0.19 | 0.04 | ND | 0.04 | ND |
| Chrysene | mg/kg | 0.25 | ND | 0.05 | 0.07 | 0.05 | 0.12 | 0.10 | 0.38 | 0.05 | 0.40 | 0.05 | 0.05 | 0.05 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | 0.05 | 0.10 | ND | 0.05 | 0.13 | 0.05 | ND | 0.05 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | ND | 0.10 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Benzo(a)pyrene | mg/kg | 0.25 | ND | 0.05 | 0.05 | 0.05 | ND | 0.10 | 0.20 | 0.05 | 0.34 | 0.05 | 0.05 | 0.05 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | 0.06 | 0.10 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | 0.07 | 0.10 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.25 | ND | 0.05 | ND | 0.05 | 0.10 | 0.10 | ND | 0.05 | 0.23 | 0.05 | 0.05 | 0.05 | ND |

PQL - Practical Quantitation Limit.
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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Table 7 (continued)
Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
Summary of Soil Sample Results
Clark Refining and Marketing, Inc.
Hartford Refinery

| Soil Sample: | | 8 | | 9 | | 10 | | 11 | | 12 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 9/29/94 | | 9/29/94 | | 9/29/94 | | 9/29/94 | | 9/29/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 20.0 | 22.6 | 4.0 | 7.5 | 4.0 | 18.4 | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 20.0 | 207.6 | 4.0 | 16.7 | 4.0 | 31.2 | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 20.0 | 191.8 | 4.0 | 20.7 | 4.0 | 46.0 | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 20.0 | 1515.0 | 4.0 | 191.8 | 4.0 | 472.0 | 4.0 | 9.4 |
| Total BTEX | µg/kg | 4.0 | ND | 20.0 | 1937.0 | 4.0 | 236.7 | 4.0 | 567.6 | 4.0 | 9.4 |
| PNAs | | | | | | | | | | | |
| Napthalene | mg/kg | 0.05 | 0.08 | 0.10 | 1.90 | 0.10 | 5.20 | 0.05 | 0.28 | 0.10 | 0.02 |
| Acenapththylene | mg/kg | 0.05 | ND | 0.10 | ND | 0.10 | ND | 0.05 | ND | 0.10 | 0.02 |
| Acenapthene | mg/kg | 0.05 | ND | 0.10 | 0.60 | 0.10 | 1.80 | 0.05 | 0.09 | 0.10 | 0.03 |
| Flourene | mg/kg | 0.05 | ND | 0.10 | 0.76 | 0.10 | 2.30 | 0.05 | 0.05 | 0.10 | ND |
| Phenanthrene | mg/kg | 0.05 | 0.49 | 0.10 | 2.30 | 0.10 | 6.40 | 0.05 | 0.22 | 0.10 | ND |
| Anthracene | mg/kg | 0.05 | 0.06 | 0.10 | 0.53 | 0.10 | 1.40 | 0.05 | ND | 0.10 | ND |
| Flouranthene | mg/kg | 0.05 | 0.22 | 0.10 | 0.35 | 0.10 | 0.61 | 0.05 | ND | 0.10 | 0.02 |
| Pyrene | mg/kg | 0.05 | 0.40 | 0.10 | 1.30 | 0.10 | 2.30 | 0.05 | 0.12 | 0.10 | ND |
| Benzo(a)anthracene | mg/kg | 0.04 | 0.48 | 0.080 | 0.71 | 0.080 | 1.40 | 0.04 | ND | 0.008 | ND |
| Chrysene | mg/kg | 0.05 | 0.60 | 0.10 | 1.20 | 0.10 | 2.20 | 0.05 | 0.05 | 0.10 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.05 | 0.19 | 0.10 | 0.22 | 0.10 | 0.30 | 0.05 | ND | 0.10 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.05 | ND | 0.10 | ND | 0.10 | ND | 0.05 | ND | 0.10 | ND |
| Benzo(a)pyrene | mg/kg | 0.05 | 0.34 | 0.10 | ND | 0.10 | ND | 0.05 | ND | 0.10 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.05 | 0.16 | 0.10 | 0.19 | 0.10 | ND | 0.05 | ND | 0.10 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.05 | 0.17 | 0.10 | 0.18 | 0.10 | 0.17 | 0.05 | ND | 0.10 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.05 | 0.19 | 0.10 | 0.15 | 0.10 | 0.11 | 0.05 | ND | 0.10 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 1 A | | 2 A | | 3 A | | 4 A | | 5 A | | 6 A | | 7 A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 10/05/94 | | 10/05/94 | | 10/05/94 | | 10/05/94 | | 10/05/94 | | 10/05/94 | | 9/29/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | 6.6 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | 10.0 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 5.0 | 4.0 | 4.1 |
| Total Xylenes | µg/kg | 4.0 | 53.1 | 4.0 | 5.0 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 18.1 | 4.0 | 27.5 |
| Total BTEX | µg/kg | 4.0 | 69.7 | 4.0 | 5.0 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 23.1 | 4.0 | 31.6 |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 0.01 | 0.01 | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.02 |
| Acenapthihylene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | ND |
| Acenapthene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | ND |
| Flourene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.02 |
| Phenanthrene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.12 |
| Anthracene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.02 |
| Flouranthene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.26 |
| Pyrene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.11 |
| Benzo(a)anthracene | mg/kg | 0.008 | ND | 0.036 | ND | 0.008 | ND | 0.036 | ND | 0.02 | ND | 0.02 | ND | 0.008 | 0.03 |
| Chrysene | mg/kg | 0.01 | 0.02 | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.09 |
| Benzo(b)fluoranthene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | 0.03 |
| Benzo(k)fluoranthene | mg/kg | 0.01 | 0.04 | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | ND |
| Benzo(a)pyrene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.01 | ND | 0.04 | ND | 0.01 | ND | 0.04 | ND | 0.02 | ND | 0.02 | ND | 0.01 | ND |

PQL - Practical Quantitation Limit.
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 8 A | | 9 A | | 10 A | | 11 A | | 12 A | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 10/05/94 | | 10/05/94 | | 10/05/94 | | 10/05/94 | | 10/05/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | 14.7 | 4.0 | 10.4 | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | 17.6 | 4.0 | 33.7 | 4.0 | 4.5 | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | 118.4 | 4.0 | 285.2 | 4.0 | 28.4 | 4.0 | ND |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | 150.7 | 4.0 | 329.3 | 4.0 | 32.9 | 4.0 | ND |
| PNAs | | | | | | | | | | | |
| Napthalene | mg/kg | 0.02 | ND | 0.01 | 0.02 | 0.02 | 0.06 | 0.01 | ND | 0.01 | 0.03 |
| Acenapththylene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |
| Acenapthene | mg/kg | 0.02 | 0.04 | 0.01 | ND | 0.02 | 0.04 | 0.01 | 0.01 | 0.01 | ND |
| Flourene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | 0.02 | 0.01 | ND | 0.01 | ND |
| Phenanthrene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | 0.05 | 0.01 | ND | 0.01 | 0.01 |
| Anthracene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | 0.02 | 0.01 | ND | 0.01 | ND |
| Flouranthene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | 0.10 | 0.01 | 0.01 | 0.01 | 0.02 |
| Pyrene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | 0.10 | 0.01 | ND | 0.01 | 0.01 |
| Benzo(a)anthracene | mg/kg | 0.016 | ND | 0.008 | ND | 0.016 | 0.03 | 0.008 | ND | 0.008 | ND |
| Chrysene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |
| Benzo(a)pyrene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.02 | ND | 0.01 | ND | 0.02 | ND | 0.01 | ND | 0.01 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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Table 7 (continued)
Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
Summary of Soil Sample Results
Clark Refining and Marketing, Inc.
Hartford Refinery

| Soil Sample: | | 1 B | | 2 B | | 3 B | | 4 B | | 5 B | | 6 B | | 7 B | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 10/26/94 | | 10/26/94 | | 10/26/94 | | 10/26/94 | | 10/26/94 | | 10/26/94 | | 10/26/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | 14.0 | 4.0 | ND | 4.0 | 10.0 | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | 10.0 | 4.0 | ND | 4.0 | 4.0 | 4.0 | 9.0 | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | 77.0 | 4.0 | ND | 4.0 | 47.0 | 4.0 | 141.0 | 4.0 | 7.0 | 4.0 | 6.0 | 4.0 | ND |
| Total BTEX | µg/kg | 4.0 | 87.0 | 4.0 | ND | 4.0 | 65.0 | 4.0 | 150.0 | 4.0 | 17.0 | 4.0 | 6.0 | 4.0 | ND |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 0.25 | 1.80 | 0.25 | ND | 0.02 | 0.08 | 0.50 | 1.60 | 0.01 | 0.07 | 0.02 | 0.09 | 0.02 | ND |
| Acenapththylene | mg/kg | 0.25 | ND | 0.25 | ND | 0.02 | ND | 0.50 | ND | 0.01 | ND | 0.02 | ND | 0.02 | ND |
| Acenapthene | mg/kg | 0.25 | 2.00 | 0.25 | 0.73 | 0.02 | 0.04 | 0.50 | 2.50 | 0.01 | 0.07 | 0.02 | ND | 0.02 | ND |
| Flourene | mg/kg | 0.25 | 2.00 | 0.25 | ND | 0.02 | ND | 0.50 | 2.30 | 0.01 | 0.04 | 0.02 | 0.03 | 0.02 | ND |
| Phenanthrene | mg/kg | 0.25 | 6.40 | 0.25 | ND | 0.02 | 0.16 | 0.50 | 7.90 | 0.01 | 0.22 | 0.02 | 0.25 | 0.02 | 0.02 |
| Anthracene | mg/kg | 0.25 | 1.50 | 0.25 | ND | 0.02 | ND | 0.50 | 1.80 | 0.01 | ND | 0.02 | 0.06 | 0.02 | ND |
| Flouranthene | mg/kg | 0.25 | 1.60 | 0.25 | 0.60 | 0.02 | 0.24 | 0.50 | ND | 0.01 | 0.04 | 0.02 | 0.20 | 0.02 | 0.05 |
| Pyrene | mg/kg | 0.25 | 2.60 | 0.25 | 1.60 | 0.02 | 0.27 | 0.50 | 3.00 | 0.01 | 0.16 | 0.02 | 0.34 | 0.02 | ND |
| Benzo(a)anthracene | mg/kg | 0.20 | ND | 0.20 | 0.47 | 0.016 | 0.13 | 0.50 | 1.30 | 0.008 | ND | 0.016 | ND | 0.016 | ND |
| Chrysene | mg/kg | 0.25 | 2.90 | 0.25 | 0.32 | 0.02 | 0.24 | 0.50 | 2.00 | 0.01 | ND | 0.02 | 0.30 | 0.02 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.25 | 0.40 | 0.25 | ND | 0.02 | 0.07 | 0.50 | ND | 0.01 | ND | 0.02 | ND | 0.02 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.25 | ND | 0.25 | 1.10 | 0.02 | 0.06 | 0.50 | ND | 0.01 | ND | 0.02 | ND | 0.02 | ND |
| Benzo(a)pyrene | mg/kg | 0.25 | ND | 0.25 | ND | 0.02 | 0.19 | 0.50 | 0.67 | 0.01 | ND | 0.02 | 0.21 | 0.02 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.25 | ND | 0.25 | ND | 0.02 | ND | 0.50 | ND | 0.01 | ND | 0.02 | ND | 0.02 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.25 | ND | 0.25 | ND | 0.02 | ND | 0.60 | ND | 0.01 | ND | 0.02 | ND | 0.02 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.25 | ND | 0.25 | ND | 0.02 | ND | 0.50 | ND | 0.01 | ND | 0.02 | ND | 0.02 | ND |

PQL - Practical Quantitation Limit.
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

I:\projects\94155\4031\work\942188

## Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 8 B | | 9 B | | 10 B | | 11 B | | 12 B | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 10/26/94 | | 10/26/94 | | 10/26/94 | | 10/26/94 | | 10/26/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | 4.0 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | 46.0 | 4.0 | ND | 4.0 | 4.0 | 4.0 | 32.0 | 4.0 | 6.0 |
| Ethylbenzene | µg/kg | 4.0 | 31.0 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | 215.0 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Total BTEX | µg/kg | 4.0 | 296.0 | 4.0 | ND | 4.0 | 4.0 | 4.0 | 32.0 | 4.0 | 6.0 |
| PNAs | | | | | | | | | | | |
| Napthalene | mg/kg | 0.25 | 4.60 | 0.03 | ND | 0.05 | 0.21 | 0.05 | 0.13 | 0.05 | 0.09 |
| Acenapthylene | mg/kg | 0.25 | ND | 0.03 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Acenapthene | mg/kg | 0.25 | 1.50 | 0.03 | 0.15 | 0.05 | 0.16 | 0.05 | 0.63 | 0.05 | ND |
| Flourene | mg/kg | 0.25 | 1.60 | 0.03 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Phenanthrene | mg/kg | 0.25 | 5.20 | 0.03 | ND | 0.05 | 0.32 | 0.05 | ND | 0.05 | 0.09 |
| Anthracene | mg/kg | 0.25 | 1.10 | 0.03 | ND | 0.05 | 0.08 | 0.05 | ND | 0.05 | ND |
| Flouranthene | mg/kg | 0.25 | 0.70 | 0.03 | 0.06 | 0.05 | 0.14 | 0.05 | ND | 0.05 | 0.09 |
| Pyrene | mg/kg | 0.25 | 1.30 | 0.03 | 0.04 | 0.05 | 0.12 | 0.05 | 0.09 | 0.05 | 0.06 |
| Benzo(a)anthracene | mg/kg | 0.20 | 0.90 | 0.024 | 0.03 | 0.04 | ND | 0.04 | ND | 0.04 | 0.08 |
| Chrysene | mg/kg | 0.25 | 1.40 | 0.03 | 0.18 | 0.05 | 0.43 | 0.05 | 0.19 | 0.05 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.25 | ND | 0.03 | ND | 0.05 | 0.11 | 0.05 | 0.07 | 0.05 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.25 | ND | 0.03 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |
| Benzo(a)pyrene | mg/kg | 0.25 | ND | 0.03 | ND | 0.05 | 0.88 | 0.05 | 0.08 | 0.05 | 0.08 |
| Dibenzo(a,h)anthracene | mg/kg | 0.25 | ND | 0.03 | ND | 0.05 | 0.13 | 0.05 | ND | 0.05 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.25 | ND | 0.03 | ND | 0.05 | 0.50 | 0.05 | ND | 0.05 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.25 | ND | 0.03 | ND | 0.05 | ND | 0.05 | ND | 0.05 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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## Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | S 1 | | S 2 | | S 3 | | S 4 | | S 5 | | S 6 | | S 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 11/01/94 | | 11/01/94 | | 11/01/94 | | 11/01/94 | | 11/01/94 | | 11/01/94 | | 11/01/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | NA | NA | NA | NA | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | NA | NA | NA | NA | 4.0 | 4.0 | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | 22.0 | NA | NA | NA | NA | 4.0 | 10.0 | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | 16.0 | 4.0 | 45.0 | NA | NA | NA | NA | 4.0 | 90.0 | 4.0 | 5.0 |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | 16.0 | 4.0 | 67.0 | NA | NA | NA | NA | 4.0 | 104.0 | 4.0 | 5.0 |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 0.05 | 0.12 | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | 0.14 | 0.01 | ND |
| Acenapththylene | mg/kg | 0.05 | ND | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Acenapthene | mg/kg | 0.05 | 0.08 | 0.25 | 4.80 | 0.05 | 0.09 | 0.02 | ND | 0.02 | ND | 0.05 | 0.10 | 0.01 | ND |
| Flourene | mg/kg | 0.05 | ND | 0.25 | 3.20 | 0.05 | 0.05 | 0.02 | 0.03 | 0.02 | 0.05 | 0.05 | 0.06 | 0.01 | ND |
| Phenanthrene | mg/kg | 0.05 | 0.24 | 0.25 | 14.80 | 0.05 | 0.20 | 0.02 | 0.02 | 0.02 | 0.04 | 0.05 | 0.27 | 0.01 | ND |
| Anthracene | mg/kg | 0.05 | ND | 0.25 | 3.30 | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Flouranthene | mg/kg | 0.05 | 0.07 | 0.25 | 1.90 | 0.05 | ND | 0.02 | 0.07 | 0.02 | 0.18 | 0.05 | 0.05 | 0.01 | ND |
| Pyrene | mg/kg | 0.05 | 0.23 | 0.25 | 7.40 | 0.05 | 0.06 | 0.02 | 0.03 | 0.02 | 0.08 | 0.05 | 0.13 | 0.01 | ND |
| Benzo(a)anthracene | mg/kg | 0.04 | ND | 0.20 | 2.30 | 0.04 | ND | 0.016 | ND | 0.016 | ND | 0.04 | ND | 0.008 | ND |
| Chrysene | mg/kg | 0.05 | 0.08 | 0.25 | 3.30 | 0.05 | ND | 0.02 | 0.03 | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.05 | ND | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.05 | ND | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Benzo(a)pyrene | mg/kg | 0.05 | ND | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.05 | ND | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.05 | ND | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.05 | ND | 0.25 | ND | 0.05 | ND | 0.02 | ND | 0.02 | ND | 0.05 | ND | 0.01 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
NA - Not available
PNAs - Polynuclear aromatic hydrocarbons

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# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | S 8 | | S 9 | |
|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | |
| Date Collected: | | 11/01/94 | | 11/01/94 | |
| PARAMETER | Units | PQL | Result | PQL | Result |
| VOLATILES | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | 7.0 |
| Ethylbenzene | µg/kg | 4.0 | 6.0 | 4.0 | 15.0 |
| Total Xylenes | µg/kg | 4.0 | 51.0 | 4.0 | 234.0 |
| Total BTEX | µg/kg | 4.0 | 57.0 | 4.0 | 256.0 |
| PNAs | | | | | |
| Napthalene | mg/kg | 0.02 | ND | 0.25 | 0.42 |
| Acenapththylene | mg/kg | 0.02 | ND | 0.25 | ND |
| Acenapthene | mg/kg | 0.02 | 0.05 | 0.25 | 0.28 |
| Flourene | mg/kg | 0.02 | ND | 0.25 | ND |
| Phenanthrene | mg/kg | 0.02 | 0.04 | 0.25 | 0.91 |
| Anthracene | mg/kg | 0.02 | ND | 0.25 | ND |
| Flouranthene | mg/kg | 0.02 | ND | 0.25 | ND |
| Pyrene | mg/kg | 0.02 | ND | 0.25 | 0.50 |
| Benzo(a)anthracene | mg/kg | 0.016 | ND | 0.20 | 0.37 |
| Chrysene | mg/kg | 0.02 | ND | 0.25 | 0.43 |
| Benzo(b)fluoranthene | mg/kg | 0.02 | ND | 0.25 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.02 | ND | 0.25 | ND |
| Benzo(a)pyrene | mg/kg | 0.02 | ND | 0.25 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.02 | ND | 0.25 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.02 | ND | 0.25 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.02 | ND | 0.25 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 51 A | | 52 A | | 53 A | | 54 A | | 55 A | | 56 A | | 57 A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 06/16/95 | | 06/16/95 | | 06/16/95 | | 06/16/95 | | 06/16/95 | | 06/16/95 | | 06/16/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | 6.0 | 4.0 | 8.5 | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | 4.8 | 4.0 | 23.4 | 4.0 | 42.5 | 4.0 | 8.1 | 4.0 | 8.3 | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | 35.3 | 4.0 | 47.6 | 4.0 | 7.5 | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | 5.0 | 4.0 | ND | 4.0 | 174.0 | 4.0 | 558.0 | 4.0 | 37.1 | 4.0 | 9.6 | 4.0 | 7.3 |
| Total BTEX | µg/kg | 4.0 | 5.0 | 4.0 | 4.8 | 4.0 | 238.7 | 4.0 | 656.6 | 4.0 | 52.7 | 4.0 | 17.9 | 4.0 | 7.3 |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 1.0 | ND | 0.05 | ND | 0.25 | 0.32 | 0.50 | ND | 1.00 | ND | 0.01 | 0.02 | 0.02 | 0.04 |
| Acenapthhylene | mg/kg | 1.0 | ND | 0.05 | ND | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | ND |
| Acenapthene | mg/kg | 1.0 | 3.6 | 0.05 | ND | 0.25 | 0.45 | 0.50 | ND | 1.00 | 2.70 | 0.01 | ND | 0.02 | ND |
| Flourene | mg/kg | 1.0 | 1.9 | 0.05 | ND | 0.25 | 0.49 | 0.50 | ND | 1.00 | 1.30 | 0.01 | ND | 0.02 | ND |
| Phenanthrene | mg/kg | 1.0 | 2.5 | 0.05 | ND | 0.25 | 1.10 | 0.50 | 0.78 | 1.00 | 2.20 | 0.01 | 0.02 | 0.02 | 0.04 |
| Anthracene | mg/kg | 1.0 | 3.2 | 0.05 | ND | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | ND |
| Flouranthene | mg/kg | 1.0 | 2.4 | 0.05 | ND | 0.25 | ND | 0.50 | ND | 1.00 | 1.20 | 0.01 | ND | 0.02 | 0.04 |
| Pyrene | mg/kg | 1.0 | 1.2 | 0.05 | 0.06 | 0.25 | 0.48 | 0.50 | 0.94 | 1.00 | 4.90 | 0.01 | 0.03 | 0.02 | 0.06 |
| Benzo(a)anthracene | mg/kg | 0.8 | 6.2 | 0.04 | ND | 0.20 | 0.39 | 0.40 | 0.60 | 0.80 | 4.10 | 0.008 | ND | 0.016 | ND |
| Chrysene | mg/kg | 1.0 | 5.8 | 0.05 | ND | 0.25 | 0.44 | 0.50 | 0.82 | 1.00 | 5.20 | 0.01 | 0.05 | 0.02 | ND |
| Benzo(b)fluoranthene | mg/kg | 1.0 | 1.3 | 0.05 | 0.06 | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | ND |
| Benzo(k)fluoranthene | mg/kg | 1.0 | ND | 0.05 | ND | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | ND |
| Benzo(a)pyrene | mg/kg | 1.0 | 1.3 | 0.05 | 0.05 | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | 0.06 |
| Dibenzo(a,h)anthracene | mg/kg | 1.0 | ND | 0.05 | ND | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | ND |
| Benzo(g,h,i)perylene | mg/kg | 1.0 | ND | 0.05 | ND | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 1.0 | ND | 0.05 | ND | 0.25 | ND | 0.50 | ND | 1.00 | ND | 0.01 | ND | 0.02 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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Table 7 (continued)
Spill # 942188 - Ten Inch Suction Line Failure
Summary of Soil Sample Results
Clark Refining and Marketing, Inc.
Hartford Refinery

| Soil Sample: | | 58 A | | 59 A | |
|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | |
| Date Collected: | | 06/16/95 | | 06/16/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result |
| VOLATILES | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | 9.6 |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | 7.6 |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | 65.6 |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | 82.8 |
| PNAs | | | | | |
| Napthalene | mg/kg | 0.02 | ND | 0.50 | ND |
| Acenapththylene | mg/kg | 0.02 | ND | 0.50 | ND |
| Acenapthene | mg/kg | 0.02 | ND | 0.50 | 0.91 |
| Flourene | mg/kg | 0.02 | ND | 0.50 | 0.79 |
| Phenanthrene | mg/kg | 0.02 | 0.02 | 0.50 | 1.50 |
| Anthracene | mg/kg | 0.02 | ND | 0.50 | ND |
| Flouranthene | mg/kg | 0.02 | ND | 0.50 | 0.57 |
| Pyrene | mg/kg | 0.02 | 0.09 | 0.50 | 1.90 |
| Benzo(a)anthracene | mg/kg | 0.016 | ND | 0.400 | 1.00 |
| Chrysene | mg/kg | 0.02 | ND | 0.50 | 1.70 |
| Benzo(b)fluoranthene | mg/kg | 0.02 | 0.02 | 0.50 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.02 | ND | 0.50 | ND |
| Benzo(a)pyrene | mg/kg | 0.02 | 0.03 | 0.50 | 0.89 |
| Dibenzo(a,h)anthracene | mg/kg | 0.02 | ND | 0.50 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.02 | ND | 0.50 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.02 | ND | 0.50 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne, Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 51 B | | 52 B | | 53 B | | 54 B | | 55 B | | 56 B | | 57 B | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 08/01/95 | | 08/01/95 | | 08/01/95 | | 08/01/95 | | 08/01/95 | | 08/01/95 | | 08/01/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 20.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 20.0 | ND | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 20.0 | 75.7 | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | 7.6 | 4.0 | ND | 4.0 | 15.1 | 20.0 | 874.0 | 4.0 | ND | 4.0 | ND |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | 7.6 | 4.0 | ND | 4.0 | 15.1 | 20.0 | 949.7 | 4.0 | ND | 4.0 | ND |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Acenapththylene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Acenapthene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | 0.25 | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Flourene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Phenanthrene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | 0.42 | 0.50 | 0.53 | 0.05 | ND | 0.05 | ND |
| Anthracene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Flouranthene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | 0.27 | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Pyrene | mg/kg | 0.50 | 1.8 | 0.20 | ND | 0.20 | 0.91 | 0.20 | 0.99 | 0.50 | 0.93 | 0.05 | ND | 0.05 | ND |
| Benzo(a)anthracene | mg/kg | 0.40 | 2.8 | 0.16 | ND | 0.16 | 1.10 | 0.16 | 1.20 | 0.40 | 0.94 | 0.04 | ND | 0.04 | ND |
| Chrysene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.50 | 1.3 | 0.20 | ND | 0.20 | 0.38 | 0.20 | 0.43 | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Benzo(a)pyrene | mg/kg | 0.50 | 1.0 | 0.20 | ND | 0.20 | 0.36 | 0.20 | 0.41 | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.50 | 0.67 | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.50 | ND | 0.20 | ND | 0.20 | ND | 0.20 | ND | 0.50 | ND | 0.05 | ND | 0.05 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 58 B | | 59 B | |
|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | |
| Date Collected: | | 08/01/95 | | 08/01/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result |
| VOLATILES | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | ND |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | ND |
| PNAs | | | | | |
| Napthalene | mg/kg | 0.20 | ND | 0.50 | ND |
| Acenapththylene | mg/kg | 0.20 | ND | 0.50 | ND |
| Acenapthene | mg/kg | 0.20 | ND | 0.50 | ND |
| Flourene | mg/kg | 0.20 | ND | 0.50 | ND |
| Phenanthrene | mg/kg | 0.20 | ND | 0.50 | 1.20 |
| Anthracene | mg/kg | 0.20 | ND | 0.50 | ND |
| Flouranthene | mg/kg | 0.20 | ND | 0.50 | 0.72 |
| Pyrene | mg/kg | 0.20 | ND | 0.50 | 2.40 |
| Benzo(a)anthracene | mg/kg | 0.16 | 0.42 | 0.400 | 2.00 |
| Chrysene | mg/kg | 0.20 | ND | 0.50 | 4.20 |
| Benzo(b)fluoranthene | mg/kg | 0.20 | 0.22 | 0.50 | 1.90 |
| Benzo(k)fluoranthene | mg/kg | 0.20 | ND | 0.50 | ND |
| Benzo(a)pyrene | mg/kg | 0.20 | ND | 0.50 | 1.60 |
| Dibenzo(a,h)anthracene | mg/kg | 0.20 | ND | 0.50 | ND |
| Benzo(g,h,l)perylene | mg/kg | 0.20 | 0.27 | 0.50 | 0.78 |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.20 | ND | 0.50 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | S 1 | | S 2 | | S 3 | | S 4 | | S 5 | | S 6 | | S 7 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | | Surface | |
| Date Collected: | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 5.4 | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 62.6 | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | 4.7 | 4.0 | ND | 4.0 | ND | 4.0 | 49.7 | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | 48.7 | 4.0 | ND | 4.0 | ND | 4.0 | 345.0 | 4.0 | 4.4 | 4.0 | ND |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | 53.4 | 4.0 | ND | 4.0 | ND | 4.0 | 462.6 | 4.0 | 4.4 | 4.0 | ND |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 0.02 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Acenaphthylene | mg/kg | 0.02 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Acenapthene | mg/kg | 0.02 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Flourene | mg/kg | 0.02 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Phenanthrene | mg/kg | 0.02 | 0.17 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | 0.51 | 0.01 | 0.02 | 0.30 | ND |
| Anthracene | mg/kg | 0.02 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Flouranthene | mg/kg | 0.02 | 0.52 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | 0.02 | 0.30 | ND |
| Pyrene | mg/kg | 0.02 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Benzo(a)anthracene | mg/kg | 0.016 | 0.12 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.008 | ND | 0.30 | ND |
| Chrysene | mg/kg | 0.02 | 0.11 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | 0.02 | 0.30 | ND |
| Benzo(b)fluoranthene | mg/kg | 0.02 | 0.12 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | 0.03 | 0.30 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.02 | 0.08 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Benzo(a)pyrene | mg/kg | 0.02 | 0.05 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | 0.02 | 0.30 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.02 | 0.04 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | ND | 0.30 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.02 | 0.11 | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | 0.02 | 0.30 | ND |
| Iddno(1,2,3,c,d)pyrene | mg/kg | 0.02 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.30 | ND | 0.01 | 0.02 | 0.30 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
NA - Not available
PNAs - Polynuclear aromatic hydrocarbons

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Table 7 (continued)
Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
Summary of Soil Sample Results
Clark Refining and Marketing, Inc.
Hartford Refinery

| | Soil Sample: | S 8 | | S 9 | |
|---|---|---|---|---|---|
| | Type of Sample: | Surface | | Surface | |
| | Date Collected: | 10/13/95 | | 10/13/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result |
| VOLATILES | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | ND |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | ND |
| PNAs | | | | | |
| Napthalene | mg/kg | 0.10 | ND | 0.30 | ND |
| Acenapththylene | mg/kg | 0.10 | ND | 0.30 | ND |
| Acenapthene | mg/kg | 0.10 | ND | 0.30 | ND |
| Flourene | mg/kg | 0.10 | ND | 0.30 | ND |
| Phenanthrene | mg/kg | 0.10 | ND | 0.30 | 0.95 |
| Anthracene | mg/kg | 0.10 | ND | 0.30 | ND |
| Flouranthene | mg/kg | 0.10 | ND | 0.30 | 0.87 |
| Pyrene | mg/kg | 0.10 | 0.14 | 0.30 | ND |
| Benzo(a)anthracene | mg/kg | 0.080 | ND | 0.30 | 0.43 |
| Chrysene | mg/kg | 0.10 | ND | 0.30 | 0.69 |
| Benzo(b)fluoranthene | mg/kg | 0.10 | ND | 0.30 | 0.47 |
| Benzo(k)fluoranthene | mg/kg | 0.10 | ND | 0.30 | ND |
| Benzo(a)pyrene | mg/kg | 0.10 | ND | 0.30 | 0.30 |
| Dibenzo(a,h)anthracene | mg/kg | 0.10 | ND | 0.30 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.10 | ND | 0.30 | ND |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.10 | ND | 0.30 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

# Table 7 (continued)
## Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
## Summary of Soil Sample Results
## Clark Refining and Marketing, Inc.
## Hartford Refinery

| Soil Sample: | | 1 C | | 2 C | | 3 C | | 4 C | | 5 C | | 6 C | | 7 C | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | 10" | | 10" | | 10" | | 10" | | 10" | | 4" | | 10" | |
| Date Collected: | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 4.4 |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | 12.7 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | 5.9 | 4.0 | 20.4 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 7.1 |
| Total BTEX | µg/kg | 4.0 | 5.9 | 4.0 | 33.1 | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | 11.5 |
| PNAs | | | | | | | | | | | | | | | |
| Napthalene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | ND | 0.30 | ND |
| Acenapthylene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | ND | 0.30 | ND |
| Acenapthene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | ND | 0.30 | ND |
| Flourene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | ND | 0.30 | ND |
| Phenanthrene | mg/kg | 0.30 | ND | 0.05 | 0.07 | 0.05 | ND | 0.30 | 0.31 | 0.05 | 0.07 | 0.10 | 0.27 | 0.30 | ND |
| Anthracene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | ND | 0.30 | ND |
| Flouranthene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | 0.36 | 0.05 | 0.06 | 0.10 | 0.18 | 0.30 | ND |
| Pyrene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | 0.15 | 0.30 | ND | 0.05 | 0.40 | 0.10 | 0.97 | 0.30 | 0.42 |
| Benzo(a)anthracene | mg/kg | 0.30 | ND | 0.04 | 0.10 | 0.04 | ND | 0.30 | 0.30 | 0.04 | ND | 0.08 | ND | 0.30 | ND |
| Chrysene | mg/kg | 0.30 | 0.30 | 0.05 | ND | 0.05 | ND | 0.30 | 0.44 | 0.05 | 0.08 | 0.10 | 0.20 | 0.30 | 0.38 |
| Benzo(b)fluoranthene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | 0.06 | 0.30 | 0.30 | 0.05 | 0.17 | 0.10 | 0.22 | 0.30 | ND |
| Benzo(k)fluoranthene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | 0.25 | 0.30 | ND |
| Benzo(a)pyrene | mg/kg | 0.30 | ND | 0.05 | 0.09 | 0.05 | ND | 0.30 | ND | 0.05 | 0.08 | 0.10 | 0.15 | 0.30 | ND |
| Dibenzo(a,h)anthracene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | ND | 0.30 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.30 | 0.50 | 0.05 | 0.08 | 0.05 | 0.13 | 0.30 | 0.47 | 0.05 | 0.23 | 0.10 | 0.63 | 0.30 | 0.67 |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.30 | ND | 0.05 | ND | 0.05 | ND | 0.30 | ND | 0.05 | ND | 0.10 | 0.23 | 0.30 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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Table 7 (continued)
Spill # 942188 - Ten Inch Suction Line Failure (FCC), Hawthorne Ave.
Summary of Soil Sample Results
Clark Refining and Marketing, Inc.
Hartford Refinery

| Soil Sample: | | 8 C | | 9 C | | 10 C | | 11 C | | 12 C | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Type of Sample: | | 10" | | 10" | | 10" | | 6" | | 6" | |
| Date Collected: | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | | 10/13/95 | |
| PARAMETER | Units | PQL | Result | PQL | Result | PQL | Result | PQL | Result | PQL | Result |
| VOLATILES | | | | | | | | | | | |
| Benzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Toluene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Ethylbenzene | µg/kg | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND | 4.0 | ND |
| Total Xylenes | µg/kg | 4.0 | ND | 4.0 | 6.1 | 4.0 | ND | 4.0 | ND | 4.0 | 5.7 |
| Total BTEX | µg/kg | 4.0 | ND | 4.0 | 6.1 | 4.0 | ND | 4.0 | ND | 4.0 | 5.7 |
| PNAs | | | | | | | | | | | |
| Napthalene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Acenapthhylene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Acenapthene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Flourene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Phenanthrene | mg/kg | 0.10 | ND | 0.10 | 0.19 | 0.10 | 0.12 | 0.30 | ND | 0.30 | ND |
| Anthracene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Flouranthene | mg/kg | 0.10 | 0.17 | 0.10 | 0.14 | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Pyrene | mg/kg | 0.10 | 0.38 | 0.10 | 0.83 | 0.10 | 0.35 | 0.30 | ND | 0.30 | 0.30 |
| Benzo(a)anthracene | mg/kg | 0.08 | 0.19 | 0.08 | 0.63 | 0.08 | ND | 0.30 | ND | 0.30 | 0.50 |
| Chrysene | mg/kg | 0.10 | ND | 0.10 | 0.25 | 0.10 | ND | 0.30 | 0.40 | 0.30 | 0.50 |
| Benzo(b)fluoranthene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | 0.30 | 0.30 | 0.40 |
| Benzo(k)fluoranthene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Benzo(a)pyrene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | 0.38 |
| Dibenzo(a,h)anthracene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |
| Benzo(g,h,i)perylene | mg/kg | 0.10 | 0.25 | 0.10 | ND | 0.10 | ND | 0.30 | 0.30 | 0.30 | 0.38 |
| Ideno(1,2,3,c,d)pyrene | mg/kg | 0.10 | ND | 0.10 | ND | 0.10 | ND | 0.30 | ND | 0.30 | ND |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/kg - Micrograms per kilogram
ND - Non-Detect
PNAs - Polynuclear aromatic hydrocarbons

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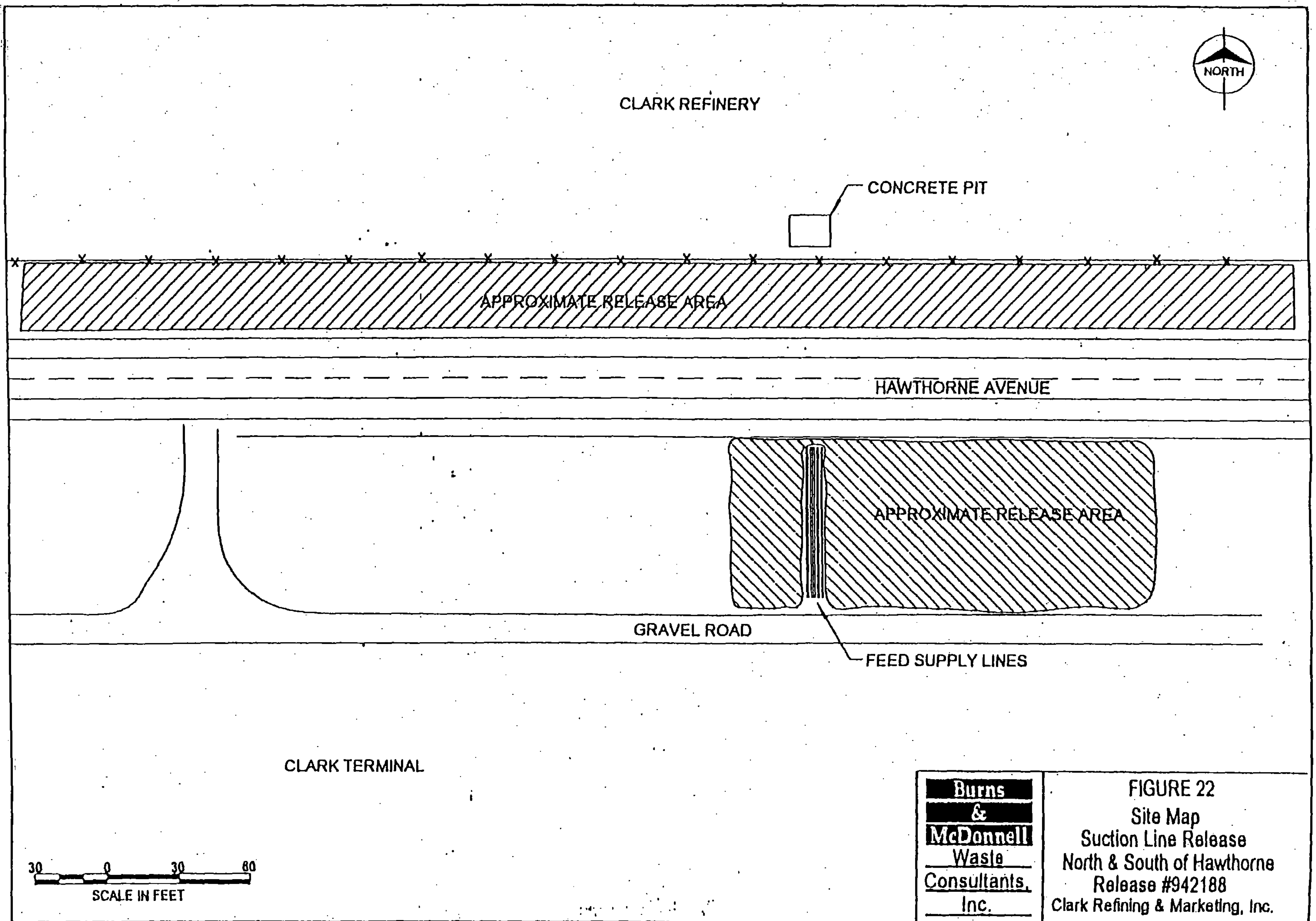



FIGURE 22
Site Map
Suction Line Release
North & South of Hawthorne
Release #942188
Clark Refining & Marketing, Inc.

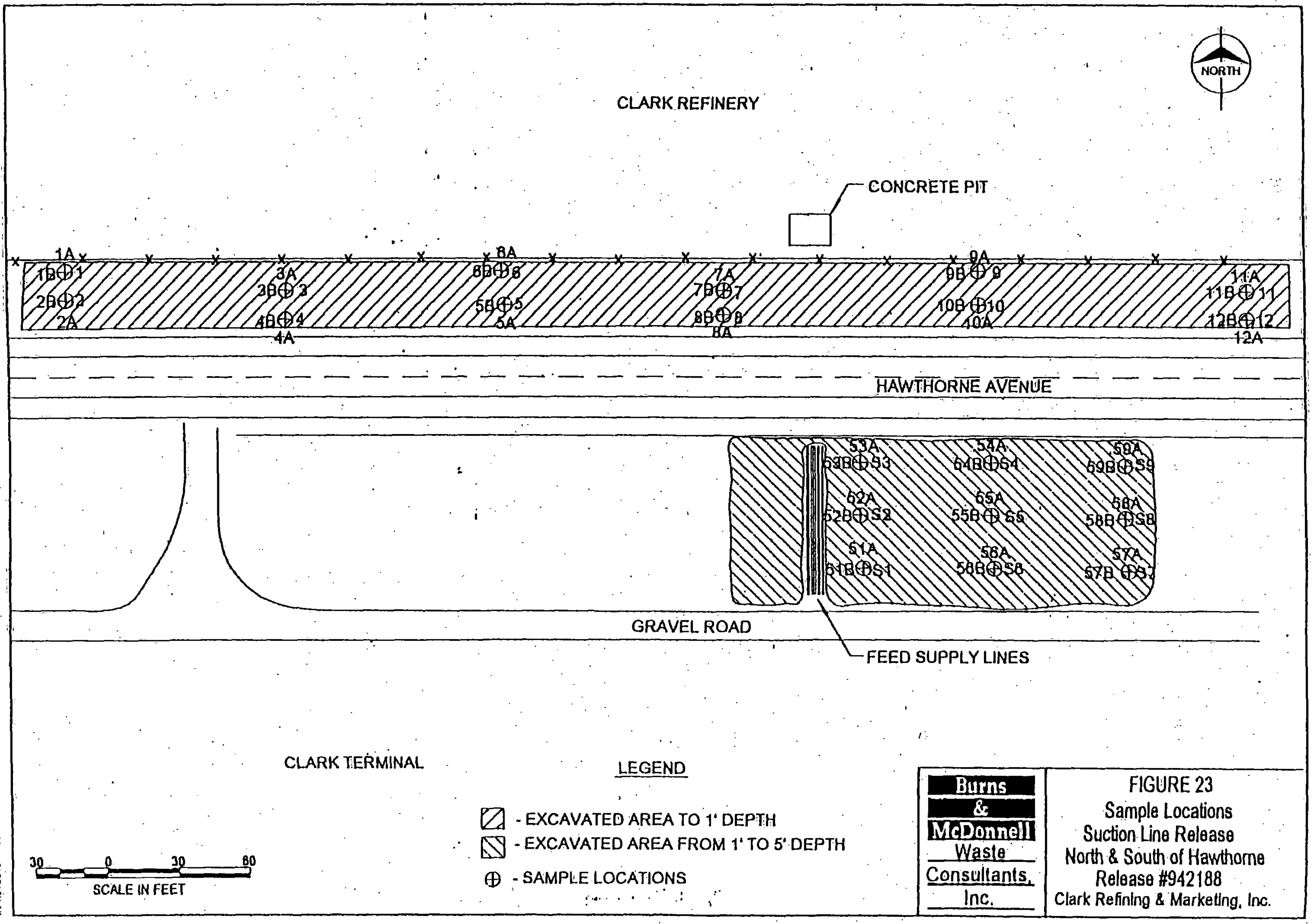
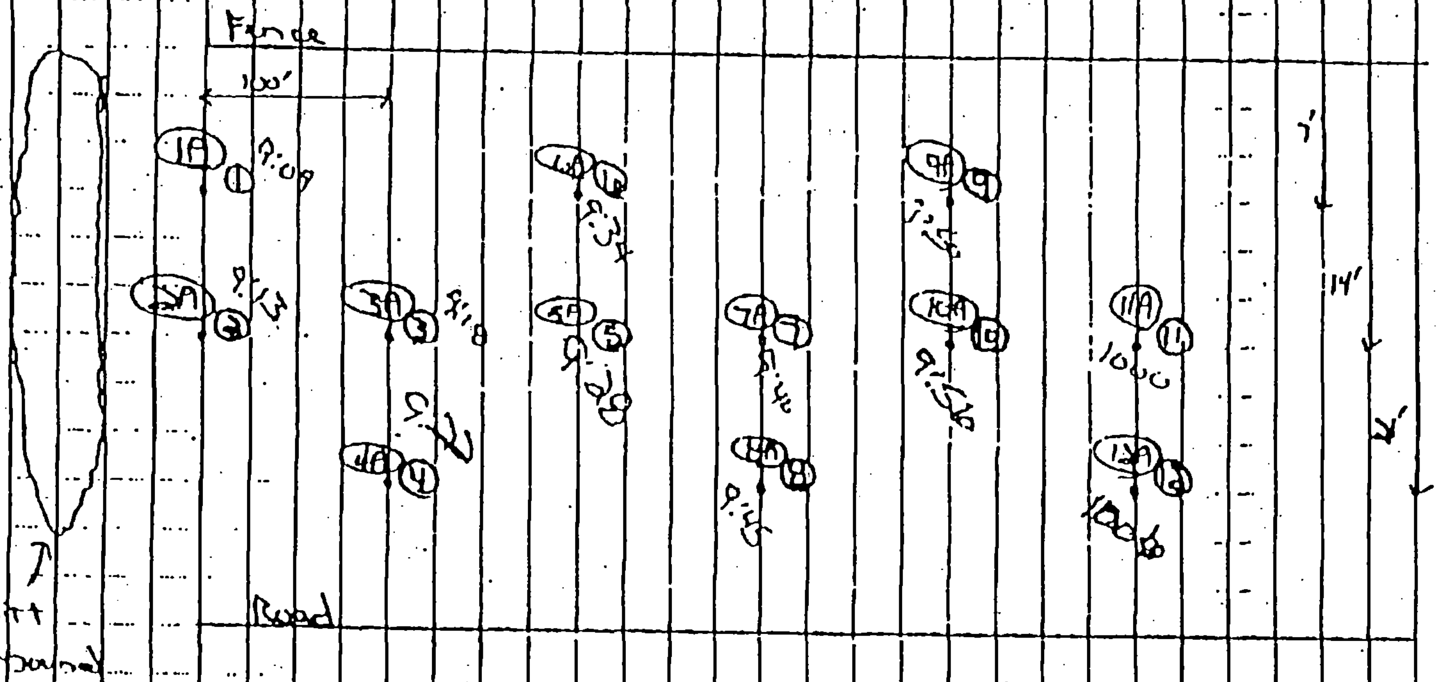



FIGURE 23
Sample Locations
Suction Line Release
North & South of Hawthorne
Release #942188
Clark Refining & Marketing, Inc.

Project: Clark O.I
Title: PNA/BTEX
From Page:
Date: 9/28/94

10/5/94 Resample 1A, 2A etc.

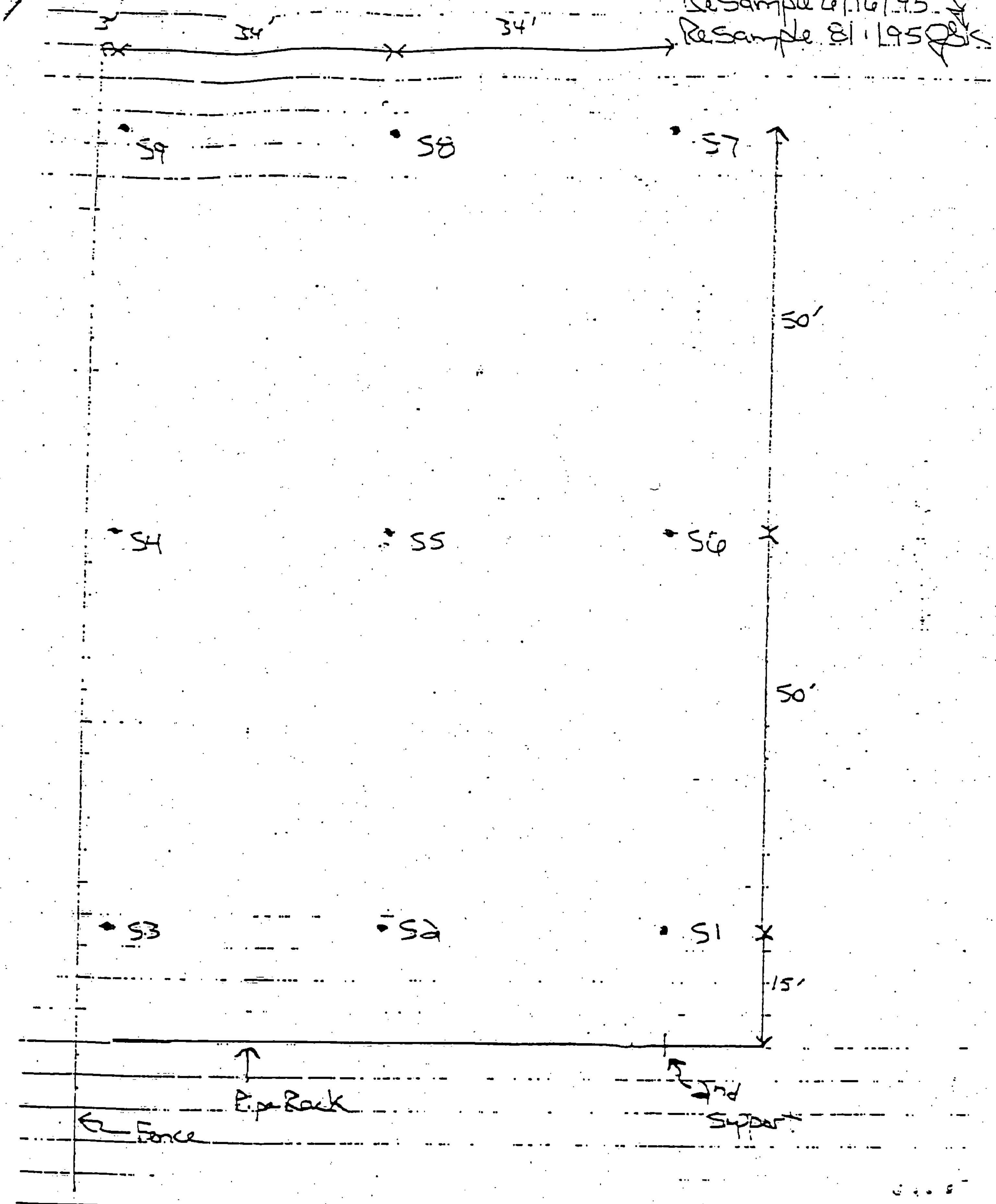



Width of Area was approx 28'. Samples were taken at a staggard distance of 7', 14' and 21' from the chain link fence. Length of Area was approx 1000'. Samples were taken at 100' intervals (Chain Link fence posts were 10' apart and used as reference points)

Clark Oil
South of Roadway Sampling Grid

11/1/94

Resample 6/16/95
Resample 8/1/95



Clayton
GROUP SERVICES

# APPENDIX Q-3

## SUMMARY REPORT
## SUBSURFACE AND SURFACE INVESTIGATION OF SPILLS
## SEPTEMBER 1996

Source: IEPA BOL

# SUMMARY REPORT:
# SURFACE AND SUBSURFACE INVESTIGATIONS OF SPILLS AT THE CLARK HARTFORD REFINERY
FOR
CLARK REFINING AND MARKETING, INC.
HARTFORD REFINERY
HARTFORD, ILLINOIS

SEPTEMBER 1996

**Project No. 94-155-4-056**



**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

# TABLE 1
## Summary of Surface Analytical Results
## Clark Refining & Marketing, Inc.
## Area H, Hawthorne Avenue Release Area
## Hartford, Illinois

| Sample Number: | | Detection | TACO | H-S-1 | H-S-2 | H-S-3 | H-S-4 | H-S-5 | H-S-6 | H-S-7 | H-S-8 | H-S-9 | H-S-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Limits | Tier 1 CUO[1] | 06/06/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/96 | 06/05/ |
| COMPOUND | | | | | | | | | | | | | |
| BTEX | | | | | | | | | | | | | |
| Benzene | µg/Kg | 1 | 20 | 4 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Toluene | µg/Kg | 1 | 5,000 | 1 | BDL | BDL | 2 | BDL | 2 | 3 | BDL | BDL | BDL |
| Ethylbenzene | µg/Kg | 1 | 5,000 | 3 | 4 | BDL | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| Xylenes (total) | µg/Kg | 1 | 74,000 | 12 | BDL | BDL | BDL | BDL | 2 | 3 | BDL | BDL | BDL |
| Total BTEX | µg/Kg | | | 20 | 4 | BDL | 2 | BDL | 4 | 6 | BDL | BDL | BDL |

| Sample Number: | | TACO | H-S-11 | | H-S-12 | | H-S-13 | | H-S-14 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/05/96 | |
| PNAs | | | DL | Result | DL | Result | DL | Result | DL | Result |
| Naphthalene | µg/Kg | 30,000 | 660 | BDL | 660 | BDL | 660 | 1,300 | 660 | BDL |
| Acenaphthylene | µg/Kg | NL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Acenaphthene | µg/Kg | 200,000 | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL |
| Fluorene | µg/Kg | 160,000 | 140 | BDL | 140 | BDL | 140 | BDL | 140 | BDL |
| Phenanthrene | µg/Kg | NL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Anthracene | µg/Kg | 4,300,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Flouranthene | µg/Kg | 980,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Pyrene | µg/Kg | 1,400,000 | 180 | BDL | 180 | BDL | 180 | 252 | 180 | BDL |
| Benzo(a)anthracene | µg/Kg | 700 | 8.7 | BDL | 8.7 | 61.9 | 8.7 | 123 | 8.7 | 64.2 |
| Chrysene | µg/Kg | 1,000 | 100 | BDL | 100 | 834 | 100 | BDL | 100 | 134 |
| Benzo(b)flouranthene | µg/Kg | 4,000 | 12.0 | BDL | 12.0 | 44.5 | 17.0 | 642 | 12.0 | 65.4 |
| Benzo(k)flouranthene | µg/Kg | 4,000 | 11.0 | BDL | 11.0 | 91.1 | 11.0 | 236 | 11.0 | 22.3 |
| Benzo(a)pyrene | µg/Kg | 800 | 15.0 | BDL | 15.0 | 59.0 | 15.0 | 121 | 15.0 | 43.6 |
| Dibenzo(a,h)anthracene | µg/Kg | 800 | 20.0 | BDL | 20.0 | 181 | 20.0 | BDL | 20.0 | 35.6 |
| Benzo(g,h,i)perylene | µg/Kg | NL | 51.0 | BDL | 51.0 | 92.6 | 51.0 | BDL | 51.0 | BDL |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 8,000 | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL |

[1] - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

µg/Kg - Microgram per kilogram

BDL - Below detection limit

PNAs - Polynuclear Aromatic Hydrocarbons analyzed by EPA Method SW846-8310

DL - Detection Limit

NL - Compound not listed in TACO Tier 1, Table B

## TABLE 2
## Summary of Subsurface Analytical Results
## Clark Refining & Marketing, Inc.
## Area H, Hawthorne Avenue Release Area
## Hartford, Illinois

| Sample Number: | | TACO | H-SB-1-2 | | H-SB-1-7 | | H-SB-2-1 | | H-SB-2-6 | | H-SB-3-5 | | H-SB-4-5 | | H-SB-5-5 | | H-SB-6-5 | | H-SB-7-5 | | H-SB-8-5 | | H-SB-9-5 | | H-SB-10-5 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO¹ | 06/06/98 | | 06/06/96 | | 06/06/98 | | 06/06/98 | | 06/05/98 | | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/05/96 | | 06/0696 | | 06/06/96 | |
| COMPOUND | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **BTEX** | | | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 1 | 3 | 5 | 59* | 1 | 10 | 1 | 4 | 5 | 12 | 1 | 1 | 1 | BDL | 1 | BDL | 1 | BDL | 1 | BDL | 1 | BDL | 1 | BDL |
| Toluene | µg/Kg | 5,000 | 1 | BDL | 5 | 88 | 1 | BDL | 1 | BDL | 5 | 21 | 1 | 3 | 1 | BDL | 1 | BDL | 1 | 3 | 1 | BDL | 1 | 2 | 1 | 1 |
| Ethylbenzene | µg/Kg | 6,000 | 1 | 4 | 5 | 56 | 1 | 150 | 1 | 15 | 5 | 54 | 1 | 5 | 1 | BDL | 1 | BDL | 1 | BDL | 1 | BDL | 1 | BDL | 1 | BDL |
| Xylenes (total) | µg/Kg | 74,000 | 1 | 2 | 5 | 150 | 1 | 110 | 1 | 9 | 5 | 170 | 1 | 12 | 1 | BDL | 1 | BDL | 1 | BDL | 1 | BDL | 1 | 1 | 1 | 1 |
| Total BTEX | µg/Kg | | | 9 | | 353 | | 270 | | 28 | | 257 | | 21 | | BDL | | BDL | | 3 | | BDL | | 3 | | 2 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **PNAs** | | | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result | DL | Result |
| Naphthalene | µg/Kg | 30,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 2,510 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Acenaphthylene | µg/Kg | NL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 2,510 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Acenaphthene | µg/Kg | 200,000 | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL | 9,000 | BDL | 1,200 | BDL | 1,200 | BDL | 1,200 | BDL |
| Fluorene | µg/Kg | 160,000 | 140 | BDL | 140 | BDL | 140 | BDL | 140 | BDL | 140 | 693 | 140 | BDL | 140 | BDL | 140 | BDL | 1,050 | BDL | 140 | BDL | 140 | BDL | 140 | BDL |
| Phenanthrene | µg/Kg | NL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | 1,370 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Anthracene | µg/Kg | 4,300,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Flouranthene | µg/Kg | 980,000 | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL | 660 | BDL |
| Pyrene | µg/Kg | 1,400,000 | 180 | BDL | 180 | BDL | 180 | BDL | 180 | BDL | 180 | BDL | 180 | BDL | 180 | BDL | 180 | BDL | 251 | BDL | 180 | BDL | 180 | BDL | 180 | BDL |
| Benzo(a)anthracene | µg/Kg | 700 | 8.7 | BDL | 8.7 | BDL | 8.7 | BDL | 8.7 | BDL | 8.7 | 213 | 8.7 | 9.2 | 8.7 | BDL | 8.7 | BDL | 65.0 | BDL | 8.7 | 41.5 | 8.7 | BDL | 8.7 | BDL |
| Chrysene | µg/Kg | 1,000 | 100 | 129 | 100 | 123 | 100 | BDL | 100 | BDL | 100 | 1,410* | 100 | BDL | 100 | BDL | 100 | BDL | 375 | BDL | 100 | BDL | 100 | BDL | 100 | BDL |
| Benzo(b)flouranthene | µg/Kg | 4,000 | 12.0 | BDL | 12.0 | 12.1 | 12.0 | BDL | 12.0 | BDL | 12.0 | 53.7 | 12.0 | BDL | 12.0 | BDL | 12.0 | BDL | 25.5 | BDL | 12.0 | BDL | 12.0 | BDL | 12.0 | BDL |
| Benzo(k)flouranthene | µg/Kg | 4,000 | 11.0 | BDL | 11.0 | BDL | 11.0 | BDL | 11.0 | BDL | 11.0 | 91.8 | 11.0 | BDL | 11.0 | BDL | 11.0 | BDL | 12.5 | BDL | 11.0 | BDL | 11.0 | BDL | 11.0 | BDL |
| Benzo(a)pyrene | µg/Kg | 800 | 15.0 | BDL | 15.0 | BDL | 15.0 | BDL | 15.0 | BDL | 15.0 | 95.0 | 15.0 | BDL | 15.0 | BDL | 15.0 | BDL | 49.5 | BDL | 15.0 | 15.9 | 15.0 | BDL | 15.0 | BDL |
| Dibenzo(a,h)anthracene | µg/Kg | 800 | 20.0 | 91.3 | 20.0 | 28.6 | 20.0 | BDL | 20.0 | BDL | 20.0 | 168 | 20.0 | BDL | 20.0 | BDL | 20.0 | BDL | 160 | BDL | 20.0 | 121 | 20.0 | BDL | 20.0 | BDL |
| Benzo(g,h,i)perylene | µg/Kg | NL | 51.0 | 57.9 | 51.0 | BDL | 51.0 | BDL | 51.0 | BDL | 51.0 | 91.6 | 51.0 | BDL | 51.0 | BDL | 51.0 | BDL | 188 | BDL | 51.0 | BDL | 51.0 | BDL | 51.0 | BDL |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 8,000 | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL | 125 | BDL | 29.0 | BDL | 29.0 | BDL | 29.0 | BDL |

¹ - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

DL - Detection Limit

µg/Kg - Microgram per kilogram

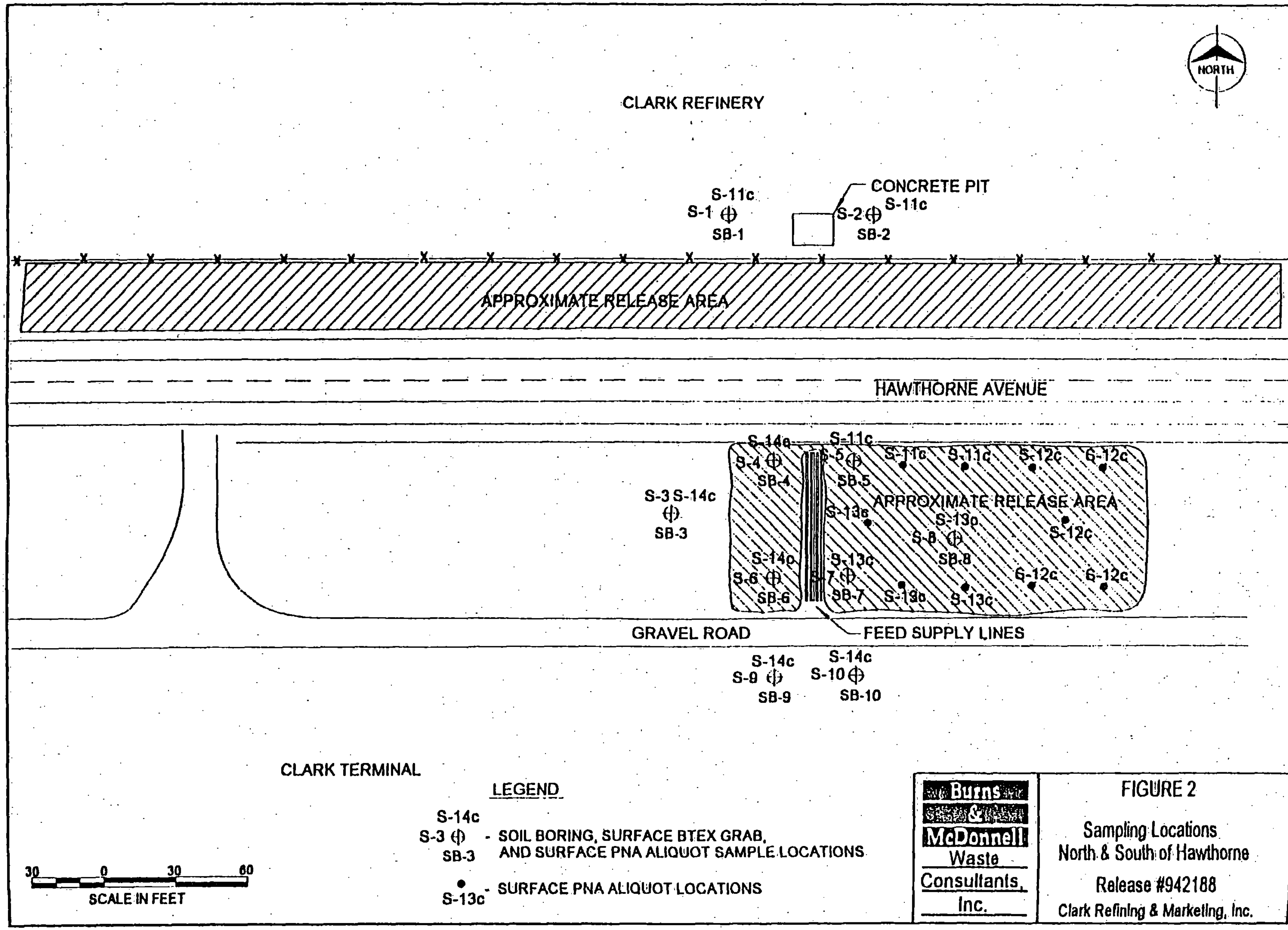
BDL - Below detection limit

PNAs - Polynuclear Aromatic Hydrocarbons analyzed by EPA Method SW846-8310

NL - Compound not listed in TACO Tier 1, Table B

59* - Above TACO Tier 1, Table B, Industrial/Commercial Cleanup Objective(ingestion, inhalation, and/or migration to groundwater)

bm279\proj\941554\056\work\tab8.wk4




Burns & McDonnell Waste Consultants, Inc.

FIGURE 2

Sampling Locations North & South of Hawthorne

Release #942188

Clark Refining & Marketing, Inc.

# APPENDIX Q-4

## TACO ASSESSMENT
## INCIDENTS 941913 AND 942188
## NOVEMBER 1997

FILE

FILE NUMBER 070.50.01.08 080.58.47

# CLARK

RETAIN IN FILE UNTIL

201 East Hawthorne
Hartford Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

November 10, 1997

Mr. Jim O'Brien, Manager
Office of Chemical Safety
Illinois Environmental Protection Agency
P.O. Box 19726
Springfield, IL 62794-9726

Re: Tiered Approach Objective Assessment

Dear Mr. O'Brien,

Enclosed is a copy of the Tiered Approach Objective assessment for the spill sites at the Hartford Refinery that was prepared by Burns & McDonnell. Clark Refining and Marketing, Inc. will provide your department with remediation techniques for two of the remaining sites in the near future.

Please call me at 618-254-7301, extension 218 with your questions.

Sincerely,

M. Modarres

Massood Modarres
Environmental Engineer

cc: John Sherrill
Tom Miller
File ✓

Burns & McDonnell | Waste Consultants, Inc.

November 3, 1997

Mr. Jim O'Brien
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794-9276

Re: Clark Refining & Marketing, Hartford Refinery: IEPA Spill Nos. 940851, 941772, 942837, 941526, 930211, 942288, 947873, 931160, 941913, 942188, and 942432

Dear Mr. O'Brien:

On behalf of Clark Refining & Marketing, Inc. (Clark), Burns & McDonnell Waste Consultants, Inc. (BMWCI) is pleased to present this Tiered Approach to Cleanup Objectives (TACO) assessment of the above-listed spill sites at the Clark Hartford Refinery. Site investigations were completed at each of these spill sites and summarized in the September 1996 report by BMWCI titled Summary Report: Surface and Subsurface Investigations of Spills at the Clark Hartford Refinery. In this letter report, the data compiled in the September 1996 report for each spill site is evaluated for compliance with TACO Tier I and Tier II cleanup objectives.

**SOIL SAMPLES**

Soil sample analytical data for surface and subsurface samples is summarized in Tables 1 and 2, respectively. Tables 1 and 2 are condensed from the September 1996 report and list only the contaminants detected at each spill site in excess of TACO Tier I Cleanup Objectives for Industrial/Commercial properties. Each spill site is designated by the area name assigned in the September 1996 report: Area A is No. 9940851; Area B is No. 941772; Area C is No. 942837; Area D is No. 941526; Area E is No. 930211; Area F is Nos. 942288 and 947873; Area G is No. 931160; Area H is Nos. 941913 and 942188; and Area J is No. 942432. Spill areas are shown on a map of the refinery, included as Figure 1. Samples from areas that are not listed in the tables were all below the Industrial/Commercial cleanup objectives. TACO Tier 1 Exposure-Route Specific Values for Soils are summarized for the contaminants of concern in Table 3 for the Industrial/Commercial, Construction Worker, and Migration to Groundwater scenarios.

In addition to the soil sampling completed for the September 1996 report, soil samples were collected September 23, 1997 from four areas for analysis of organic carbon. Soil samples were collected from two locations each in Areas B, C, H, and J, and analyzed for

17 Cassens Court
Fenton, Missouri 63026

Phone: 314 305-0077
Fax: 314 326-8295
http://www.burnsmcd.com

Organic Matter using ASTM D2974-87 and for Total Organic Carbon using EPA SW-846. The samples were collected from below the contaminated zone at depths ranging from 7 to 12 feet below ground surface. Analytical data is presented in Table 4. Although both methods are approved for determination of the fraction of organic carbon ($f_{oc}$), the site-specific $f_{oc}$ values used for this assessment were calculated from the ASTM method of analyzing for organic matter. These values are also presented in Table 4.

**TIER II CLEANUP OBJECTIVES**

The site-specific $f_{oc}$ was evaluated for Areas B, C, H, and J so that site-specific cleanup objectives could be calculated for the Migration to Groundwater pathway. The TACO Tier I cleanup objectives given in TACO Appendix B, Table A for the Migration to Groundwater pathway are calculated for subsurface soil samples with a default $f_{oc}$ value of 0.002 gm/gm. Table 5 presents the site-specific cleanup objectives for the Migration to Groundwater pathway in addition to the surface and subsurface soil default objectives. The site-specific cleanup objectives were calculated using Equation S17 in TACO Appendix C, Table A. Default values for clay soil were used for density and porosity values.

To use calculated site-specific cleanup objectives, TACO specifies three additional concentration limits that cannot be exceeded for a site:

- the soil saturation limit for each chemical (calculated according to Section 742.220) cannot be exceeded,

- the soil attenuation capacity for each site (calculated according to Section 742.215) cannot be exceeded, and

- a weighted average of 1 (calculated according to Section 742.720) cannot be exceeded at each site for chemicals that target the same organ.

According to TACO Table E in Appendix A, the contaminants of concern to this study that target the same organ include only toluene and ethylbenzene, which both target the kidneys. These contaminants are present together above TACO Tier 1 Industrial/Commercial cleanup objectives for Area B only. Of the 8 samples listed in Table 1, the weighted average exceeds 1 for samples S-1 and S-13.

The soil attenuation capacity is represented by the organic carbon concentration in the soil at each site. The total concentration of all organic contaminants of concern at a site is

compared to the total organic material in the soil at that site. The total organic contaminant concentrations for all areas discussed in this assessment fall below the default organic matter concentration of 2000 milligrams per kilogram (mg/kg). (Please refer to the September 1996 report for complete soil analytical data.)

Soil saturation limits for benzene, toluene, ethylbenzene, and xylenes (BTEX) are given in TACO Appendix A, Table A. As indicated in the footnotes of Table 5, soil saturation limits are used as cleanup objectives when calculated objectives exceed the saturation limits.

**TIER II ASSESSMENTS**
In the following pages, each area is individually evaluated relative to the calculated TACO Tier II cleanup objectives presented in Table 5. All of the areas discussed in this assessment are areas that do not support full-time workers or structures. Clark personnel are present in the areas only intermittently and these areas are not generally accessible to the public. It is therefore reasonable at each of these sites that the construction worker scenario be used for the ingestion and inhalation cleanup objectives.

Each of the assessment pages in Attachment A addresses the status of a single area. The contaminants of concern (COCs) in both surface and subsurface soil are represented by the highest concentration for each in that area (refer to Tables 1 and 2 for complete soil sample information). In cases were detection limits exceed the cleanup objectives, non-detect samples are considered to be in excess of the cleanup objectives. The limiting scenario(s) for each area are determined by selecting the most conservative cleanup objectives from Table 5. The Tier II assessment for each area is then a direct comparison of the site data with the most conservative site-specific cleanup objectives.

**SUMMARY**
TACO assessment of each of the areas at the Clark Refinery, as shown in Attachment A, indicates that Areas A, E, F, G, and H are all below TACO Tier II cleanup objectives for the applicable contaminant pathway scenarios. These areas do not require further assessment or remediation.

Area B, surrounding Tank 35-2 in the tank yard, has surface and subsurface concentrations of BTEX constituents that exceed the TACO Tier II cleanup objectives. The cleanup objectives for this area include the calculated site-specific concentration for benzene (migration to groundwater pathway), and the construction worker scenario concentrations for TEX.

Area C, surrounding Tank 55-1 in the tank yard, has subsurface soil concentrations of benzene in two samples that exceed the Tier II cleanup objectives. The benzene cleanup objective for this area is a calculated site-specific concentration for the migration to groundwater pathway.

Area D, surrounding Tank 10-5 in the tank yard, has surface and subsurface soil concentrations of benzene that exceed Tier II cleanup objectives. The benzene cleanup objectives for this area are the generic TACO Tier I values, migration to groundwater pathway, for surface and subsurface soil.

Area J, along Illinois Route 3, has two subsurface soil samples in excess of the Tier II cleanup objectives for benzene, and one subsurface soil sample in excess of the Tier II cleanup objectives for benzo(b)fluoranthene and dibenzo(a,h)anthracene. The cleanup objectives for this area are calculated site-specific concentrations, migration to groundwater pathway, for these three contaminants.

If you have any questions concerning this assessment, please contact me at (314) 305-0077, ext. 226.

Sincerely,

Paul Christian
Project Manager

attachment

| | |
|---|---|
| LOCATION: | Area H - Hawthorne |
| MEDIA: | Soil |
| CLASSIFICATION: | Industrial/Commercial with no full time workers and no structures. Use Construction Worker scenario. |
| COCs - SURFACE: | NA |
| COCs - SUBSURFACE: | Benzene 0.059 mg/kg |
| LIMITING SCENARIO: | Migration to Groundwater (site-specific): Benzene 0.135 mg/kg |

TIER II ASSESSMENT:

All surface soil samples are below all applicable TACO Tier I cleanup objectives.

All subsurface soil samples are below the site-specific migration to groundwater cleanup objective calculated for benzene.

APPENDIX R

# APPENDIX R

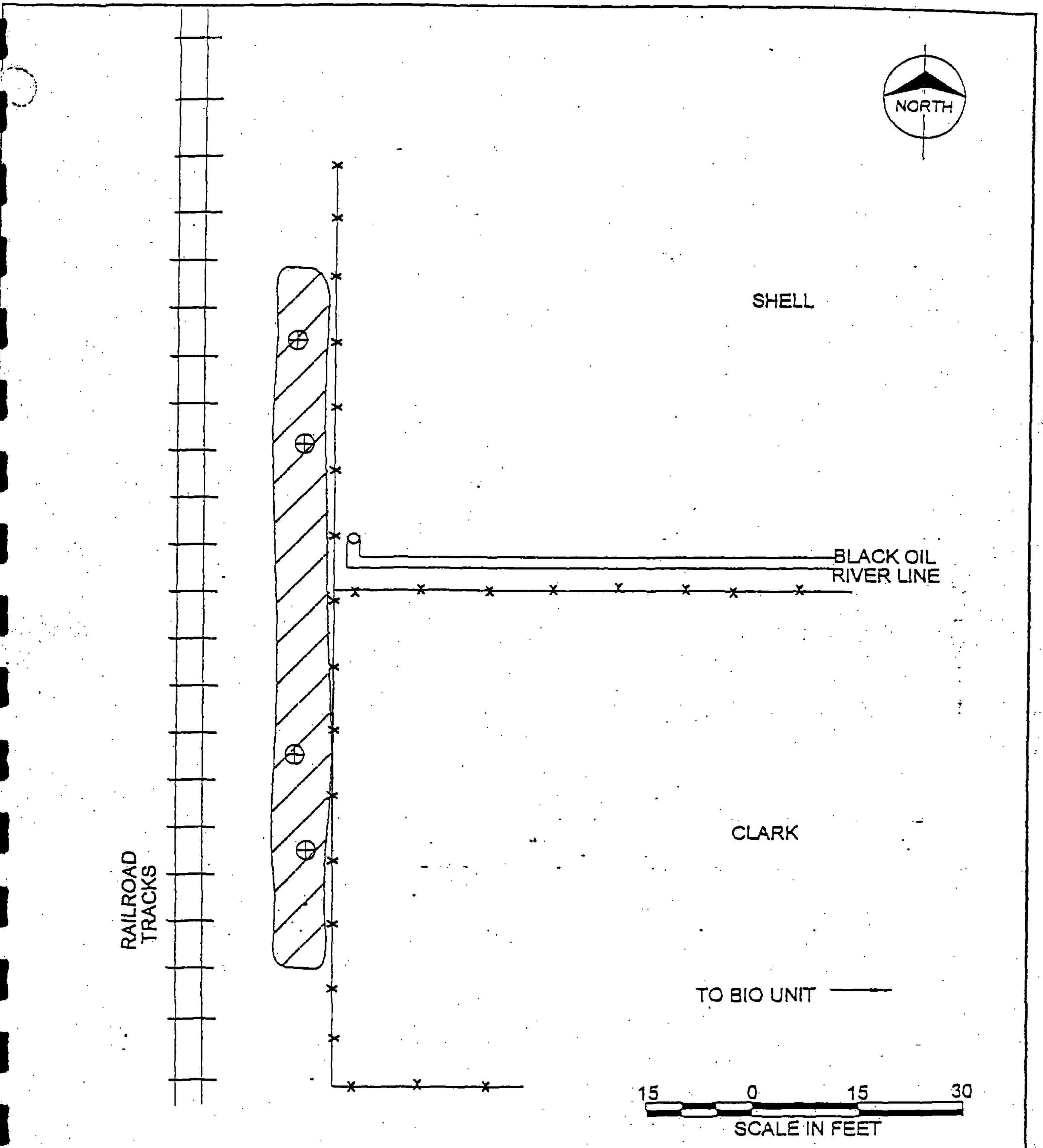
# APPENDIX R

## DOCUMENTS RELATED TO THE WASTE WATER TREATMENT PLANT

Clayton
GROUP SERVICES

# APPENDIX R-1

**INCIDENT 940851**
**APRIL 19, 1994**




LEGEND

- EXCAVATED AREA (1' DEPTH)
- COMPOSITE SAMPLE LOCATIONS

Burns & McDonnell Waste Consultants, Inc.

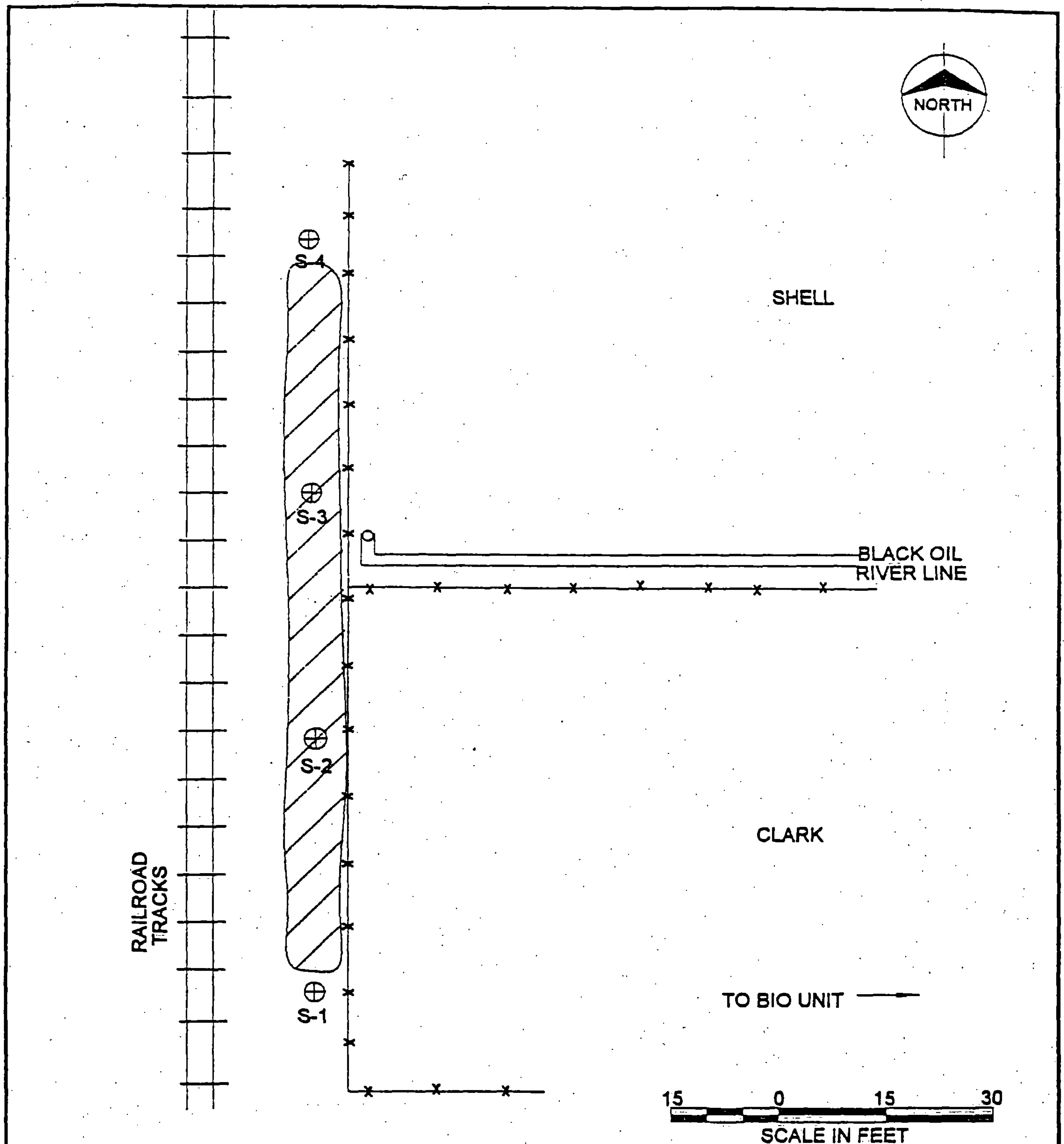
FIGURE 3
Sample Locations
Asphalt Spill Northwest
of Bio Unit
Release #940851
Clark Refining & Marketing, Inc.

Table 1
Spill # 940851 - Asphalt Spill Northwest of Bio Unit
Summary of Soil Sample Results
Clark Refining and Marketing, Inc.
Hartford Refinery

| | | Soil Sample: | BIO WEST | |
|---|---|---|---|---|
| | | Type of Sample: | Composite | |
| | | Date Collected: | 04/26/94 | |
| PARAMETER | Units | Regulatory Level | PQL | Result |
| TCLP METALS | | | | |
| Arsenic | mg/l | 5.0 | 0.2 | ND |
| Barium | mg/l | 100.0 | 0.1 | 1.862 |
| Cadmium | mg/l | 1.0 | 0.005 | ND |
| Chromium | mg/l | 5.0 | 0.01 | ND |
| Lead | mg/l | 5.0 | 0.1 | ND |
| Mercury | mg/l | 0.2 | 0.0002 | ND |
| Selenium | mg/l | 1.0 | 0.2 | ND |
| Silver | mg/l | 5 | 0.04 | ND |
| TCLP VOC-8240 | | | | |
| Vinyl Chloride | µg/l | 200 | 100 | ND |
| 1,1-Dichloroethene | µg/l | 700 | 50 | ND |
| Chloroform | µg/l | 6,000 | 200 | ND |
| 1,2-Dichloroethane | µg/l | 500 | 50 | ND |
| 2-Butanone | µg/l | 200,000 | 150 | 75JB |
| Carbon Tetrachloride | µg/l | 500 | 50 | ND |
| Trichloroethene | µg/l | 500 | 50 | ND |
| Benzene | µg/l | 500 | 50 | ND |
| Tetrachloroethene | µg/l | 700 | 50 | ND |
| Chlorobenzene | µg/l | 100,000 | 50 | ND |
| 1,4-Dichlorobenzene | µg/l | 7,500 | 100 | ND |
| TCLP VOC-8270 | | | | |
| Pyridine | µg/l | 5,000 | 500 | ND |
| o-Cresol | µg/l | 200,000 | 100 | ND |
| m & p-Cresol | µg/l | 200,000 | 100 | ND |
| Hexachloroethane | µg/l | 3,000 | 100 | ND |
| Nitrobenzene | µg/l | 2,000 | 100 | ND |
| Hexachlorobutadience | µg/l | 500 | 100 | ND |
| 2,4,6-Trichlorophenol | µg/l | 2,000 | 100 | ND |
| 2,4,5-Trichlorophenol | µg/l | 400,000 | 100 | ND |
| 2,4-Dinitrotoluene | µg/l | 3,000 | 100 | ND |
| Hexachlorobenzene | µg/l | 130 | 100 | ND |
| Pentachlorophenol | µg/l | 100,000 | 100 | ND |
| SW-846 | | | | |
| Reactive Cyanide | mg/kg | | 0.2 | ND |
| Corrosivity (pH) | | | | 7.32 |
| Phenols | mg/kg | | 1 | ND |
| Reactive Sulfide | mg/kg | | 0.1 | ND |
| Ignitability | degrees F | | | >200 (F) |
| Paint Filter | | | | Passed |

PQL - Practical Quantitation Limit
mg/kg - Milligrams per kilogram
µg/l - Micrograms per liter
mg/l - Milligrams per liter
ND - Non-Detect
B - Present in Blank
J - Detected, but below PQL

E:\projects\94133\4031\work\940851




LEGEND

- EXCAVATED AREA (1' DEPTH)

S-1 - SURFACE SOIL SAMPLE LOCATIONS

Burns & McDonnell Waste Consultants, Inc.

FIGURE 2
Sample Locations
Asphalt Spill Northwest of Bio Unit
Release #940851
Clark Refining & Marketing, Inc.

# TABLE 1
## Summary of Analytical Results
## Clark Refining & Marketing, Inc.
## Area A, Northwest of Biological Treatment Unit
## Hartford, Illinois

| Sample Number: | | TACO | S-1 | | S-2 | | S-3 | | S-4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/14/96 | | 06/14/96 | | 06/14/96 | | 06/14/96 | |
| COMPOUND | | | | | | | | | | |
| BTEX | | | DL | Result | DL | Result | DL | Result | DL | Result |
| Benzene | µg/Kg | 20 | 1 | BDL | 5 | BDL | 125** | BDL | 1 | BDL |
| Toluene | µg/Kg | 5,000 | 1 | BDL | 5 | 6 | 125 | BDL | 1 | BDL |
| Ethylbenzene | µg/Kg | 5,000 | 1 | BDL | 5 | 22 | 125 | 1,200 | 1 | BDL |
| Xylenes (total) | µg/Kg | 74,000 | 1 | BDL | 5 | 73 | 125 | 3,200 | 1 | BDL |
| Total BTEX | µg/Kg | | | BDL | | 101 | | 4,400 | | BDL |

| Sample Number: | | TACO | S-5 | | S-6 | |
|---|---|---|---|---|---|---|
| Sample Date: | Units | Tier 1 CUO[1] | 06/14/96 | | 06/14/96 | |
| COMPOUND | | | | | | |
| PNAs | | | DL | Result | DL | Result |
| Naphthalene | µg/Kg | 30,000 | 660 | 1,990 | 660 | BDL |
| Acenaphthylene | µg/Kg | NL | 660 | 1,260 | 660 | 1,190 |
| Acenaphthene | µg/Kg | 200,000 | 1,200 | BDL | 1,200 | BDL |
| Fluorene | µg/Kg | 160,000 | 140 | BDL | 140 | 491 |
| Phenanthrene | µg/Kg | NL | 660 | 960 | 660 | 984 |
| Anthracene | µg/Kg | 4,300,000 | 660 | BDL | 660 | BDL |
| Flouranthene | µg/Kg | 980,000 | 660 | 1,650 | 660 | 661 |
| Pyrene | µg/Kg | 1,400,000 | 334 | 1,650 | 180 | 1,110 |
| Benzo(a)anthracene | µg/Kg | 700 | 86.6 | 1,050* | 43.3 | 1,080* |
| Chrysene | µg/Kg | 1,000 | 100 | 724 | 1,000 | 19,700* |
| Benzo(b)flouranthene | µg/Kg | 900 | 68.0 | 1,860* | 68.0 | 1,450* |
| Benzo(k)flouranthene | µg/Kg | 4,000 | 16.6 | 573 | 33.2 | 437 |
| Benzo(a)pyrene | µg/Kg | 90 | 66.0 | 1,210* | 33.0 | 851* |
| Dibenzo(a,h)anthracene | µg/Kg | 90 | 20.0 | 1,030* | 100 | 2,250* |
| Benzo(g,h,i)perylene | µg/Kg | NL | 250 | 822 | 125 | 462 |
| Indeno(1,2,3-cd)pyrene | µg/Kg | 900 | 166 | 1,600* | 83.0 | 732 |

1. - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table A, Soil Cleanup Objectives for Residentiall Properties

BTEX - Benzene, Toluene, Ethylbenzene, and Xylenes analyzed by EPA Method SW846-8020

DL - Detection Limit

µg/Kg - Microgram per kilogram

PNAs - Polynuclear Aromatic Hydrocarbons

BDL - Below detection limit

NL - Compound not listed in TACO Tier 1, Table A

125** - Detection limit exceeds TACO Tier 1 Table A value

488* - Above TACO Tier 1, Table A, Residential Cleanup Objective (ingestion, inhalation, and/or migration to groundwater)

# APPENDIX R-2

## CERCLA EXPANDED SITE INSPECTION
## NOVEMBER 2000


Sample Location Ma
Figure 4

# CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

**TABLE 1**

Analytical Results (Qualified Data)

Page 3

Case #: 28678 SDG : EE01K
Site : CLARK OIL
Lab. : LIBRTY
Reviewer :
Date :

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | | 21 | | 24 | | 39 | | 26 | | 26 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Volatile Compound** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** | **Result** | **Flag** |
| Dichlorodifluoromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Vinyl Chloride | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromomethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Trichlorofluoromethane | 12 | U | 13 | U | 12 | U | 10 | U | 1 | J | 14 | UJ | 11 | UJ | 16 | UJ | 2 | J | 16000 | U |
| 1,1-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Acetone | 23 | J | 17 | J | 21 | J | 24 | J | 49 | J | 14 | UJ | 160 | J | 29 | UJ | 49 | J | 24000 | |
| Carbon Disulfide | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 2 | J | 16 | UJ | 4 | J | 16000 | U |
| Methyl Acetate | 12 | UJ | 13 | UJ | 12 | UJ | 10 | UJ | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Methylene Chloride | 15 | | 13 | U | 16 | | 10 | U | 11 | U | 24 | U | 18 | U | 17 | U | 17 | U | 4100 | J |
| trans-1,2-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Methyl tert-Butyl Ether | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1-Dichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| cis-1,2-Dichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 2-Butanone | 12 | UJ | 13 | UJ | 4 | J | 10 | UJ | 4 | J | 14 | UJ | 23 | J | 16 | UJ | 12 | UJ | 16000 | U |
| Chloroform | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,1-Trichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Cyclohexane | 12 | U | 13 | U | 12 | U | 2 | J | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Carbon Tetrachloride | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Benzene | 12 | U | 13 | U | 12 | U | 1 | J | 11 | U | 14 | U | 11 | U | 16 | U | 53 | | 34000 | J |
| 1,2-Dichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Trichloroethene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Methylcyclohexane | 12 | U | 13 | U | 12 | U | 3 | J | 11 | U | 14 | U | 11 | U | 16 | U | 120 | | 89000 | |
| 1,2-Dichloropropane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromodichloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| cis-1,3-Dichloropropene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 4-Methyl-2-pentanone | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Toluene | 1 | J | 13 | U | 2 | J | 4 | J | 11 | U | 2 | J | 3 | J | 16 | U | 4 | J | 16000 | U |
| trans-1,3-Dichloropropene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,1,2-Trichloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Tetrachloroethene | 2 | J | 2 | J | 12 | U | 1 | J | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 2-Hexanone | 12 | U | 13 | U | 12 | U | 10 | U | 11 | UJ | 14 | UJ | 11 | UJ | 16 | UJ | 12 | UJ | 16000 | U |
| Dibromochloromethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dibromoethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Chlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Ethylbenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 3 | J | 110000 | |
| Xylenes (total) | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 4 | J | 11 | U | 16 | U | 8 | J | 160000 | |
| Styrene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Bromoform | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| Isopropylbenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 18 | | 17000 | |
| 1,1,2,2-Tetrachloroethane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,3-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,4-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |
| 1,2-Dibromo-3-chloropropane | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | UJ |
| 1,2,4-Trichlorobenzene | 12 | U | 13 | U | 12 | U | 10 | U | 11 | U | 14 | U | 11 | U | 16 | U | 12 | U | 16000 | U |

CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

TABLE 2



Analytical Results (Qualified Data)

Case #: 28578
Site:
Lab:
Reviewer:
Date:

SDG : EE01K
CLARK OIL
LIBRTY

| Sample Number : | EE012 | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | | 21 | | 24 | | 39 | | 26 | | 26 | |
| pH : | 7.0 | | 7.7 | | 7.5 | | 7.9 | | 6.5 | | 7.2 | | 7.7 | | 8.0 | | 8.5 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| Semivolatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| Benzaldehyde | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Phenol | 450 | U | 440 | U | 350 | U | 100 | J | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| bis-(2-Chloroethyl) ether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2-Chlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2-Methylphenol | 450 | U | 440 | U | 350 | U | 58 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,2'-oxybis(1-Chloropropane) | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Acetophenone | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 4-Methylphenol | 450 | U | 440 | U | 350 | U | 110 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| N-Nitroso-di-n-propylamine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Hexachloroethane | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Nitrobenzene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Isophorone | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2-Nitrophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,4-Dimethylphenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| bis(2-Chloroethoxy)methane | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,4-Dichlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Naphthalene | 450 | U | 440 | U | 350 | U | 180 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 660 | |
| 4-Chloroaniline | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Hexachlorobutadiene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Caprolactam | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 4-Chloro-3-methylphenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | UJ |
| 2-Methylnaphthalene | 450 | U | 440 | U | 350 | U | 650 | | 420 | U | 420 | U | 430 | U | 540 | U | 220 | J | 5100 | |
| Hexachlorocyclopentadiene | 450 | UJ | 440 | U | 350 | UJ | 390 | UJ | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,4,6-Trichlorophenol | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,4,5-Trichlorophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| 1,1'-Biphenyl | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 86 | J |
| 2-Chloronaphthalene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2-Nitroaniline | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| Dimethylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 2,6-Dinitrotoluene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Acenaphthylene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 3-Nitroaniline | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| Acenaphthene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 120 | J |
| 2,4-Dinitrophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | UJ | 1100 | UJ | 1100 | U |
| 4-Nitrophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | UJ | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| Dibenzofuran | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 140 | J |
| 2,4-Dinitrotoluene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Diethylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Fluorene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 270 | J |
| 4-Chlorophenyl-phenyl ether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 4-Nitroaniline | 1100 | U | 1100 | UJ | 880 | U | 980 | U | 1100 | U | 1100 | UJ | 1100 | UJ | 1400 | UJ | 1100 | UJ | 1100 | U |
| 4,6-Dinitro-2-methylphenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | U | 1100 | U | 1100 | U | 1400 | U | 1100 | U | 1100 | U |
| N-Nitrosodiphenylamine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 4-Bromophenyl-phenylether | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Hexachlorobenzene | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Atrazine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Pentachlorophenol | 1100 | U | 1100 | U | 880 | U | 980 | U | 1100 | UJ | 1100 | UJ | 1100 | UJ | 1400 | U | 1100 | U | 1100 | U |
| Phenanthrene | 450 | U | 440 | U | 350 | U | 160 | J | 420 | U | 420 | U | 430 | U | 540 | U | 140 | J | 770 | |
| Anthracene | 450 | U | 440 | U | 350 | U | 70 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 66 | J |
| Carbazole | 450 | U | 440 | UJ | 350 | U | 43 | J | 420 | U | 420 | UJ | 430 | UJ | 540 | UJ | 450 | UJ | 450 | U |
| Di-n-butylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Fluoranthene | 450 | U | 440 | U | 350 | U | 220 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Pyrene | 450 | U | 110 | J | 350 | U | 230 | J | 420 | UJ | 420 | U | 430 | U | 540 | U | 450 | U | 74 | J |
| Butylbenzylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| 3,3'-Dichlorobenzidine | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | UJ | 430 | UJ | 540 | U | 450 | U | 450 | U |
| Benzo(a)anthracene | 450 | U | 440 | U | 350 | U | 160 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Chrysene | 450 | U | 74 | J | 350 | U | 180 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| bis(2-Ethylhexyl)phthalate | 450 | U | 45 | J | 73 | J | 69 | J | 420 | U | 420 | U | 430 | U | 60 | J | 450 | U | 450 | U |
| Di-n-octylphthalate | 450 | U | 440 | U | 350 | U | 390 | U | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(b)fluoranthene | 450 | U | 440 | U | 350 | U | 130 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(k)fluoranthene | 450 | U | 440 | U | 350 | U | 120 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(a)pyrene | 450 | U | 440 | U | 350 | U | 100 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Indeno(1,2,3-cd)pyrene | 450 | U | 440 | U | 350 | U | 86 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Dibenzo(a,h)anthracene | 450 | U | 440 | U | 350 | U | 56 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |
| Benzo(g,h,i)perylene | 450 | U | 440 | U | 350 | U | 190 | J | 420 | U | 420 | U | 430 | U | 540 | U | 450 | U | 450 | U |

**CLARK OIL & REFINING COMPANY**

HARTFORD, ILLINOIS

**TABLE 3**

| Analytical Results (Qualified Data) | | Page 3 |
|---|---|---|
| Case #: 28678 | SDG : EE01K | |
| Site : | CLARK OIL | |
| Lab. : | LIBRTY | |
| Reviewer : | | |
| Date : | | |

| Sample Number : | EE01Z | | EE020 | | EE021 | | EE022 | | EE025 | | EE026 | | EE027 | | EE028 | | EE029 | | EE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Moisture : | 27 | | 25 | | 6 | | 15 | | 22 | | 21 | | 24 | | 39 | | 26 | | 26 | |
| pH : | 7.0 | | 7.7 | | 7.5 | | 7.9 | | 6.5 | | 7.2 | | 7.7 | | 8.0 | | 8.5 | | 8.5 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Pesticide/PCB Compound** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| alpha-BHC | 2.3 | U | 2.2 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| beta-BHC | 2.3 | U | 2.3 | U | 1.8 | U | 1.6 | J | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 0.93 | J | 2.3 | U |
| delta-BHC | 2.3 | U | 2.0 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| gamma-BHC (Lindane) | 2.3 | U | 4.0 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Heptachlor | 2.3 | U | 2.3 | U | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Aldrin | 2.3 | U | 1.0 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Heptachlor epoxide | 2.3 | U | 2.3 | U | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Endosulfan I | 2.3 | U | 2.3 | U | 1.8 | U | 0.52 | J | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Dieldrin | 4.5 | U | 1.5 | J | 3.5 | U | 19 | J | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDE | 4.5 | U | 4.4 | U | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endrin | 4.5 | U | 4.0 | J | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endosulfan II | 4.5 | U | 4.4 | U | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDD | 4.5 | U | 1.8 | J | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endosulfan sulfate | 4.5 | U | 4.4 | U | 3.5 | U | 25 | J | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| 4,4'-DDT | 4.5 | U | 3.8 | J | 3.5 | U | 3.9 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Methoxychlor | 23 | U | 15 | J | 18 | U | 51 | J | 22 | U | 22 | U | 22 | U | 28 | UJ | 23 | U | 23 | U |
| Endrin ketone | 4.5 | U | 3.6 | J | 3.5 | U | 84 | U | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 4.5 | U | 4.5 | U |
| Endrin aldehyde | 4.5 | U | 1.7 | J | 3.5 | U | 10 | J | 4.2 | U | 4.2 | U | 4.3 | U | 5.4 | UJ | 1.7 | J | 4.5 | U |
| alpha-Chlordane | 2.3 | U | 1.6 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| gamma-Chlordane | 2.3 | U | 1.5 | J | 1.8 | U | 2.0 | U | 2.2 | U | 2.2 | U | 2.2 | U | 2.8 | UJ | 2.3 | U | 2.3 | U |
| Toxaphene | 230 | U | 230 | U | 180 | U | 200 | U | 220 | U | 220 | U | 220 | U | 280 | UJ | 230 | U | 230 | U |
| Aroclor-1016 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1221 | 92 | U | 89 | U | 71 | U | 79 | U | 86 | U | 85 | U | 88 | U | 110 | UJ | 91 | U | 91 | U |
| Aroclor-1232 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1242 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1248 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1254 | 45 | U | 44 | U | 35 | U | 1600 | J | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |
| Aroclor-1260 | 45 | U | 44 | U | 35 | U | 39 | U | 42 | U | 42 | U | 43 | U | 54 | UJ | 45 | U | 45 | U |

**CLARK OIL & REFINING COMPANY**

HARTFORD, ILLINOIS

KEY SAMPLES

TABLE 8

| Analytical Results (Qualified Data) | | Page 3 |
|---|---|---|
| Case #: 28678 | SDG : MEE01B | |
| Site : | CLARK OIL | |
| Lab. : | LIBRTY | |
| Reviewer : | J. GANZ | |
| Date : | DECEMBER 12, 2000 | |

| Sample Number : | MEE01Z | | MEE020 | | MEE021 | | MEE022 | | MEE025 | | MEE026 | | MEE027 | | MEE028 | | MEE029 | | MEE02A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X121 | | X122 | | X123 | | X124 | | X125 | | X126 | | X127 | | X128 | | X129 | | X130 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | | 11/9/00 | |
| Time Sampled : | 15:50 | | 16:50 | | 16:55 | | 17:10 | | 10:00 | | 10:25 | | 12:00 | | 12:15 | | 15:45 | | 16:00 | |
| %Solids : | 88.0 | | 83.2 | | 95.2 | | 74.8 | | 76.2 | | 83.8 | | 75.6 | | 70.8 | | 76.9 | | 74.1 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| | | | | | | | | | Background | | | | | | | | | | | |
| ANALYTE | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| ALUMINUM | 3950 | | 5200 | | 1630 | | 5620 | | 11400 | | 4280 | | 14400 | | 14100 | | 14700 | | 6860 | |
| ANTIMONY | 0.52 | UJ | 0.53 | UJ | 0.45 | UJ | 0.58 | UJ | 0.61 | J | 0.51 | R | 0.64 | J | 0.65 | R | 0.60 | R | 0.65 | J |
| ARSENIC | 0.77 | U | 0.78 | U | 0.66 | U | 4.0 | J | 3.3 | | 0.75 | U | 7.4 | | 7.8 | | 5.3 | | 5.0 | |
| BARIUM | 40.6 | | 56.5 | | 26.6 | | 125 | | 171 | | 50.1 | | 187 | | 322 | | 256 | | 161 | |
| BERYLLIUM | 0.17 | J | 0.24 | J | 0.090 | J | 0.59 | | 0.83 | | 0.35 | J | 0.93 | | 1.0 | | 0.87 | | 0.51 | J |
| CADMIUM | 0.070 | U | 0.070 | U | 0.060 | U | 0.43 | J | 0.080 | U | 0.070 | U | 0.16 | J | 0.15 | J | 0.080 | U | 0.080 | U |
| CALCIUM | 879 | | 2320 | | 556 | | 149000 | | 4230 | | 1560 | | 11300 | | 9900 | | 7750 | | 23900 | |
| CHROMIUM | 6.9 | | 9.3 | | 5.7 | | 47.1 | | 15.8 | | 7.8 | | 86.0 | | 18.1 | | 17.3 | | 11.4 | |
| COBALT | 2.9 | | 3.6 | | 3.0 | | 7.1 | | 5.8 | | 3.8 | | 9.1 | | 8.6 | | 8.1 | | 8.4 | |
| COPPER | 7.3 | | 9.9 | | 4.0 | | 45.1 | | 20.1 | | 8.1 | | 25.2 | | 26.9 | | 25.4 | | 16.3 | |
| IRON | 4690 | | 7740 | | 3480 | | 12500 | | 18400 | | 7740 | | 23300 | | 21900 | | 19900 | | 17300 | |
| LEAD | 4.3 | | 7.4 | | 2.7 | | 73.7 | | 20.6 | | 5.9 | | 45.2 | | 18.7 | | 21.5 | | 13.8 | |
| MAGNESIUM | 972 | | 1400 | | 833 | | 7220 | | 2630 | | 1470 | | 3860 | | 5190 | | 4130 | | 8360 | |
| MANGANESE | 30.6 | | 228 | | 34.9 | | 418 | | 372 | | 48.4 | | 825 | | 473 | | 601 | | 516 | |
| MERCURY | 0.090 | J | 0.10 | J | 0.070 | J | 0.16 | J | 0.10 | J | 0.050 | J | 0.18 | J | 0.10 | J | 0.070 | J | 0.090 | J |
| NICKEL | 7.9 | | 10.8 | | 8.1 | | 19.8 | | 14.9 | J | 9.9 | J | 22.3 | J | 23.3 | J | 21.7 | J | 21.6 | J |
| POTASSIUM | 372 | | 643 | | 140 | | 1180 | | 1090 | J | 422 | J | 1420 | J | 2370 | J | 1470 | J | 1320 | J |
| SELENIUM | 0.98 | UJ | 0.98 | UJ | 0.84 | UJ | 1.1 | UJ | 1.5 | J | 1.6 | J | 1.8 | J | 1.2 | UJ | 1.1 | UJ | 1.2 | UJ |
| SILVER | 0.090 | U | 0.090 | U | 0.080 | U | 0.10 | U | 0.10 | U | 0.090 | U | 0.10 | U | 0.11 | U | 0.10 | U | 0.11 | U |
| SODIUM | 207 | J | 344 | J | 167 | J | 353 | J | 195 | J | 206 | J | 346 | J | 354 | J | 377 | J | 443 | J |
| THALLIUM | 3.3 | J | 8.3 | | 2.0 | J | 3.0 | J | 11.7 | | 5.0 | J | 15.4 | | 13.3 | | 13.2 | | 9.9 | |
| VANADIUM | 12.2 | | 12.0 | | 10.4 | | 25.2 | | 25.8 | | 13.3 | | 34.9 | | 34.7 | | 30.5 | | 21.7 | |
| ZINC | 16.3 | | 27.6 | | 10.2 | | 427 | | 66.7 | | 25.1 | | 92.4 | | 70.5 | | 62.1 | | 46.3 | |
| CYANIDE | 0.050 | U | 0.050 | U | 0.050 | U | 0.060 | U | * | | * | | * | | * | | * | | * | |

* -- No results reported from Laboratory.

Highlighted entries are at least three times background, some will be ten times background if background level is estimated.

# APPENDIX R-3

## VIOLATION NOTICE M-2001-01015
## APRIL 18, 2001

[redacted]able[redacted]

# SUMMARY OF SOIL ANALYTICAL DATA
## THE PREMCOR REFINING GROUP, INC.
## DAF AREA
## HARTFORD, ILLINOIS

| Sample Number: | | DAF-1-S | DAF-4-D | DAF-5-S | DAF-5-D | IEPA |
|---|---|---|---|---|---|---|
| Sample Date: | | 02/07/02 | 02/07/02 | 02/07/02 | 02/07/02 | |
| Approximate Sample Depth: | | 0-6 Inches | 18-24 Inches | 0-6 Inches | 18-24 Inches | |
| PARAMETERS | UNITS | | | | | Tier 1 |
| Benzene | µg/kg | 8.4 | 1.1J | 278 | 0.8J | 30 |
| Toluene | µg/kg | 5.6 | 1.2J | 64J | 1.2J | 13,000 |
| Ethylbenzene | µg/kg | 1.1J | ND(4.3) | 76J | ND(4.8) | 12,000 |
| Xylenes | µg/kg | 4.5 | 8.4 | 454 | 3.3J | 150,000 |
| PNA Constituents | | | | | | |
| Naphthalene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | 84 |
| Acenaphthylene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | -- |
| Acenaphthene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | 570 |
| Fluorene | mg/kg | ND(0.17) | 0.33 | 5.3 | ND(0.013) | 560 |
| Phenanthrene | mg/kg | ND(0.17) | 1.2 | 12 | 0.021 | -- |
| Anthracene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | 12,000 |
| Fluoranthene | mg/kg | ND(0.17) | 1.6 | 18 | 0.034 | 3,100 |
| Pyrene | mg/kg | ND(0.17) | ND(0.12) | 2.8 | ND(0.013) | 2,300 |
| Benzo(a)anthracene | mg/kg | 0.48 | ND(0.099) | ND(0.27) | ND(0.010) | 2 |
| Chrysene | mg/kg | ND(0.17) | 0.37 | 11 | ND(0.013) | 88 |
| Benzo(b)fluoranthene | mg/kg | ND(0.17) | 0.27 | ND(0.34) | ND(0.013) | 5 |
| Benzo(k)fluoranthene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | 9 |
| Benzo(a)pyrene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | 0.8 |
| Dibenzo(a,h)anthracene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | 0.8 |
| Benzo(g,h,i)perylene | mg/kg | ND(0.17) | ND(0.12) | ND(0.34) | ND(0.013) | -- |
| Indeno(1,2,3-cd)pryene | mg/kg | ND(0.17) | ND(0.12) | 0.38 | ND(0.013) | 0.9 |
| Cyanide | mg/kg | ND(0.57) | ND(0.63) | ND(0.55) | ND(0.67) | 40 |
| Chromium | mg/l | ND(0.010) | ND(0.010) | 0.005J | ND(0.010) | 420* |
| Nickel | mg/l | 0.045 | 0.042 | 0.060 | 0.099 | 700 |
| Lead | mg/l | 0.158 | 0.065 | 0.115 | 0.025J | 400* |
| Total organic carbon | mg/kg | 3,400 | 13,000 | 15,000 | 19,500 | |
| pH | S.U. | 7.24 | 8.19 | 6.75 | 6.76 | |

IEPA TACO Tier 1 = Most stringent of Tier 1 industrial/commercial exposure pathways from the Illinois Environmental Protection Agency Title 35 Subtitle G, Chapter I, subchapter f, PART 742; Tiered Approach to Corrective Action Objectives

µg/kg = Micrograms per liter

mg/kg = Milligrams per kilogram

mg/l = Milligrams per liter

ND (0.013) = Not detected (detection limit)

* Based on ingestion and inhalation pathways

DAFSoilLab

**Table 1**
**SUMMARY OF SOIL ANALYTICAL DATA**
**THE PREMCOR REFINING GROUP, INC.**
**DAF AREA**
**HARTFORD, ILLINOIS**

| Sample Number: | | DAF-1-S | DAF-1-D | DAF-2-S | DAF-2-D | DAF-3-S | DAF-3-D | DAF-4-S | IEPA |
|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | | 02/07/02 | 02/07/02 | 02/07/02 | 02/07/02 | 02/07/02 | 02/07/02 | 02/07/02 | |
| Approximate Sample Depth: | | 0-6 inches | 18-24 inches | 0-6 inches | 18-24 inches | 0-6 inches | 18-24 inches | 0-6 inches | |
| PARAMETERS | UNITS | | | | | | | | Tier 1 |
| Benzene | µg/kg | 8.4 | 1.1J | 7.1 | 1.0J | 105 | 0.7J | 450 | 30 |
| Toluene | µg/kg | 5.6 | 1.3J | 6.9 | 1.1J | 38J | ND(5.2) | 68 | 13,000 |
| Ethylbenzene | µg/kg | 1.1J | ND(4.0) | 0.9J | ND(4.2) | 47J | ND(5.2) | 133 | 12,000 |
| Xylenes | µg/kg | 4.5 | 3.9J | 8.0 | 3.6J | 684 | 4.0 | 1740 | 150,000 |
| PNA Constituents | | | | | | | | | |
| Naphthalene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | 84 |
| Acenaphthylene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | – |
| Acenaphthene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | 570 |
| Fluorene | mg/kg | ND(0.17) | 0.92 | 0.10 | 0.59 | 2.1 | 0.028 | 7.0 | 560 |
| Phenanthrene | mg/kg | ND(0.17) | 0.26 | ND(0.016) | 1.7 | 5.9 | 0.11 | 20 | – |
| Anthracene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | 12,000 |
| Fluoranthene | mg/kg | ND(0.17) | 1.1 | ND(0.016) | 3 | 12 | 0.17 | 19 | 3,100 |
| Pyrene | mg/kg | ND(0.17) | 0.53 | ND(0.016) | 0.53 | 2.7 | ND(0.013) | ND(0.45) | 2,300 |
| Benzo(a)anthracene | mg/kg | 0.48 | 0.73 | ND(0.013) | ND(0.14) | 9.9 | ND(0.010) | ND(0.36) | 2 |
| Chrysene | mg/kg | ND(0.17) | 1.3 | 0.30 | 1.6 | 8.7 | 0.13 | 7.9 | 88 |
| Benzo(b)fluoranthene | mg/kg | ND(0.17) | 1.6 | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | 1.9 | 5 |
| Benzo(k)fluoranthene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | 9 |
| Benzo(a)pyrene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | 0.8 |
| Dibenzo(a,h)anthracene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | 0.8 |
| Benzo(g,h,i)perylene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | ND(0.18) | ND(0.46) | ND(0.013) | ND(0.45) | – |
| Indeno(1,2,3-cd)pryene | mg/kg | ND(0.17) | ND(0.12) | ND(0.016) | 0.48 | ND(0.46) | ND(0.013) | 1.8 | 0.9 |
| Cyanide | mg/kg | ND(0.57) | ND(0.58) | ND(0.55) | ND(0.59) | ND(0.66) | ND(0.63) | ND(0.58) | 40 |
| Chromium | mg/l | ND(0.010) | ND(0.010) | ND(0.010) | ND(0.010) | ND(0.010) | ND(0.010) | ND(0.010) | 420* |
| Nickel | mg/l | 0.045 | 0.044 | 0.019 | 0.035 | 0.036 | 0.080 | 0.050 | 700 |
| Lead | mg/l | 0.158 | 0.163 | 0.337 | 0.105 | 0.027 | 0.173 | 1.21 | 400* |
| Total organic carbon | mg/kg | 3,400 | >60,000 | 1,960 | 19,100 | 30,000 | 15,700 | 18,300 | |
| pH | S.U. | 7.24 | 8.70 | 8.31 | 7.07 | 8.44 | 8.50 | 8.71 | |

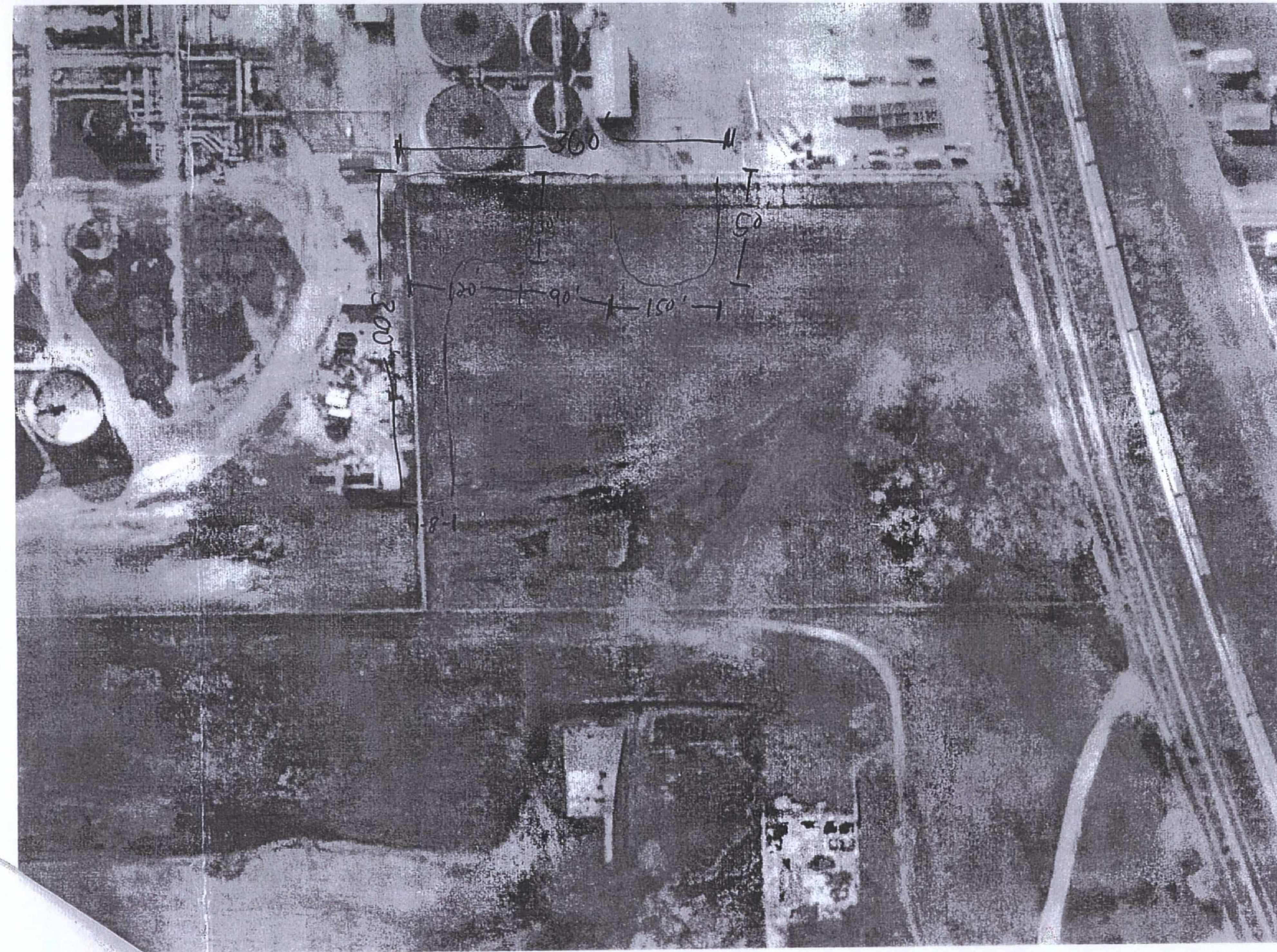
IEPA TACO Tier 1 = Most stringent of Tier 1 industrial/commercial exposure pathways from the Illinois Environmental Protection Agency .
Title 35 Subtitle G, Chapter I, subchapter f, PART 742; Tiered Approach to Corrective Action Objectives
µg/kg = Micrograms per liter
mg/kg = Milligrams per kilogram
mg/l = Milligrams per liter
ND (0.013) = Not detected (detection limit)
* Based on ingestion and inhalation pathways

DAFSoilLab

Clayton
GROUP SERVICES

# APPENDIX R-4

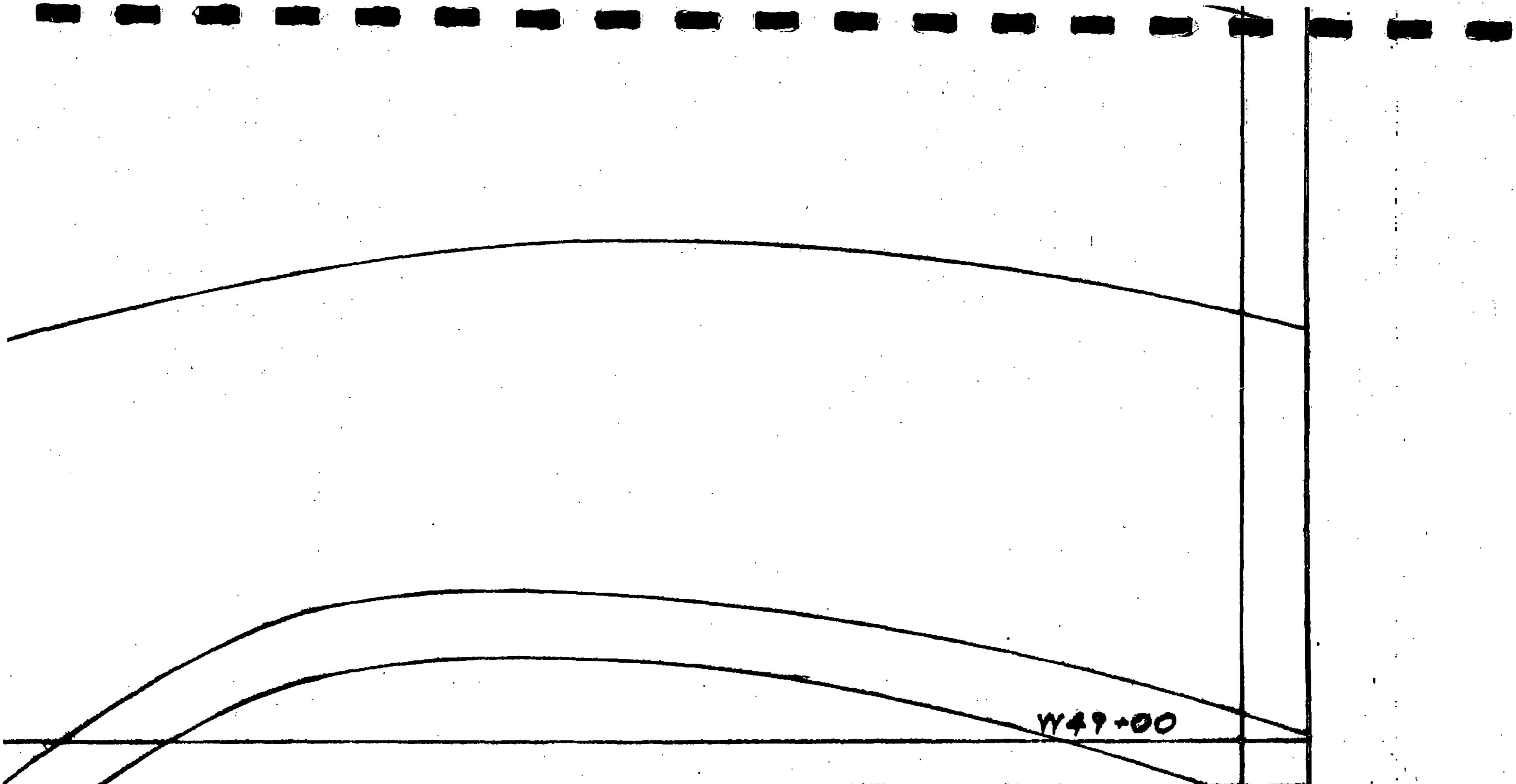
## ASPHALTIC OIL RELEASE
## NOVEMBER 8, 2001


360'
30'
50
300'
120'
90'
150'

Clayton GROUP SERVICES

# APPENDIX R-5

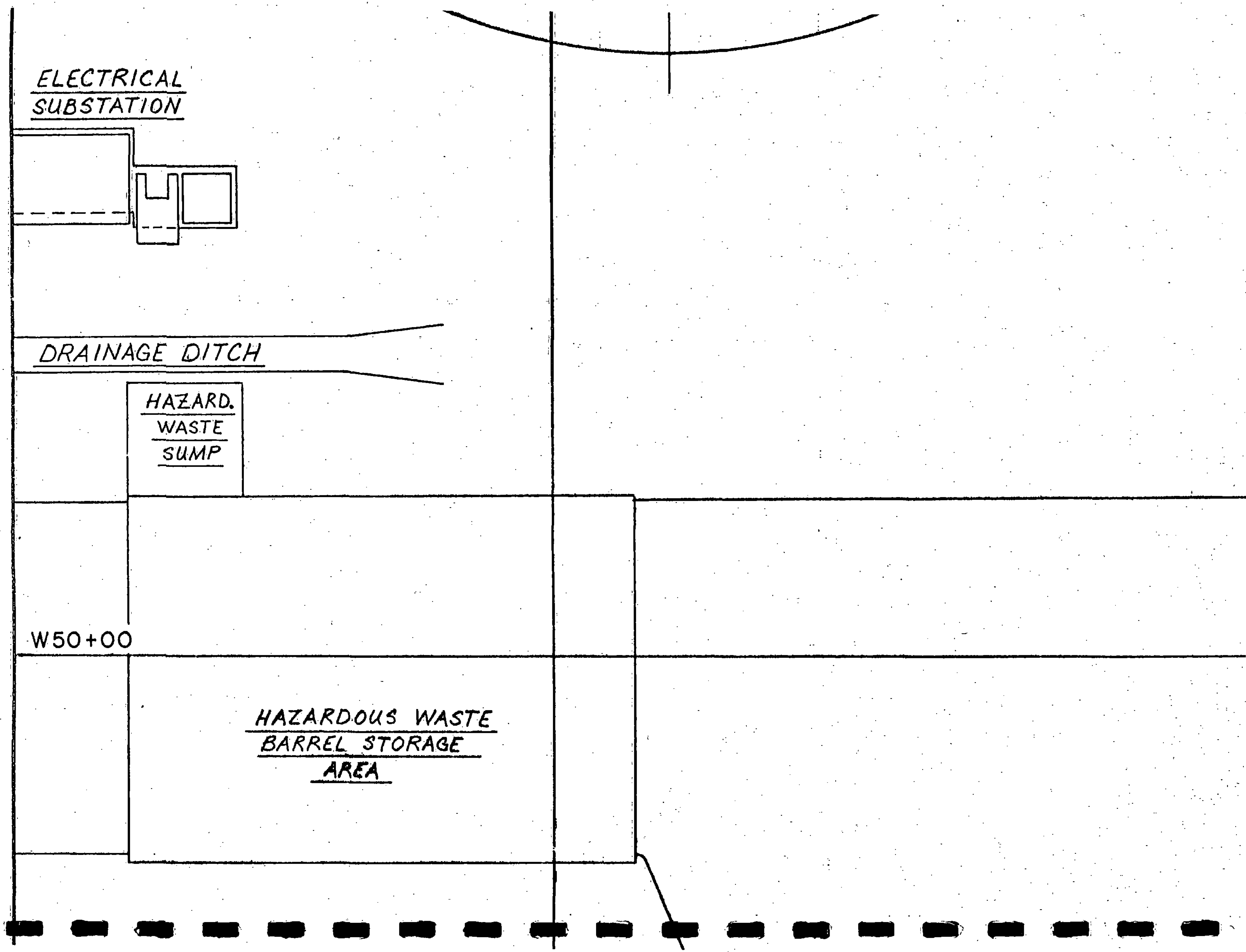
## HAZARDOUS WASTE SUMP
## HAZARDOUS WASTE BARREL STORAGE AREA
## 1974




**CLARK OIL & REFINING Corporation**

HARTFORD, ILLINOIS

| | | |
|---|---|---|
| DR'N R.L.B. | PLANT AREA MAP 5D | DRAWING No. |
| APP'D | N31+00 TO N34+00 | WRO24-FB-5D |
| DATE | W49+00 TO W51+00 | |
| SCALE 1" = 10' | | |


ELECTRICAL SUBSTATION
DRAINAGE DITCH
HAZARD. WASTE SUMP
W50+00
HAZARDOUS WASTE BARREL STORAGE AREA

# APPENDIX S

## DOCUMENTS RELATED TO THE STORM WATER RETENTION AREA

FILE NUMBER 076.30.30

RETAIN IN FILE UNTIL ________

# CLARK OIL & REFINING CORPORATION

**DRAFT**

# GUARD BASIN AND LIME PITS FINDINGS OF PRELIMINARY SAMPLING AND ANALYSIS EFFORT AND SCREENING OF CLOSURE TECHNOLOGIES

APRIL 1993

TABLE OF CONTENTS
FINDINGS OF PRELIMINARY
GUARD BASIN AND LIME PITS SAMPLING AND ANALYSIS EFFORT
AND
SCREENING OF CLOSURE TECHNOLOGIES



APPENDICES

## SECTION 1.0

## INTRODUCTION

The Clark Oil & Refining Corporation (Clark) Hartford Refinery located in Hartford, Illinois operates surface impoundments, the Guard Basin manages stormwater and receives some process wastewater, the Lime Pits receive sludges from the raw water treatment system and a minor amount of wastewater from the HF Alkylation unit at the facility. Clark intends to treat the sludges contained in the impoundments, close the Lime Pits and continue to use the Guard Basin for managing stormwater from the facility. In order to develop a closure plan, Clark has sampled the impoundment sludges to develop preliminary information on their chemical composition and to determine if treatment is required prior to disposal. Soils and groundwater samples from around the impoundments were sampled and analyzed to determine whether waste constituents have been released from these units.

The Sampling and Analysis Plan prepared by Clark Oil contains procedures for sampling and analysis of sludges contained in the Guard Basin and Lime Pits. A copy of the Sampling and Analysis Plan is included in Appendix No. 1. The objective of the investigation was to determine:

1. The volume of sludge contained in the impoundments;

2. The chemical and physical characteristics of the sludges and affected soils;

3. Whether the soils around the Guard Basin and Lime Pits have been affected by a release (Preliminary Assessment);

4. Whether the groundwater in the area of the impoundments contains indicator constituents or has been affected by releases from these units;

5. The geologic and hydrologic conditions in the area of the impoundments;

This report summarizes the findings of the investigation proposed by Clark Oil in November 1992. The Guard Basin and Lime Pits Sampling and Analysis Plan was submitted to the Illinois EPA (IEPA) in November 1992. Clark Oil initiated this investigation in January 1993 to obtain preliminary information on the sludges and soils in the impoundments. In March 1993, comments regarding the proposed plan were received from the IEPA. This report does not address those comments. Clark Oil will conduct further sampling to address issues still remaining from the March 1993 comments.

# SECTION 2.0

## SAMPLING AND ANALYTICAL RESULTS

### 2.1 Sampling Activities

Field sampling activities were conducted during January and February by Heritage Remediation\Engineering, Inc. The Guard Basin and Lime Pits Sampling and Analysis Plan for conducting the investigation is provided in Appendix No. 1. A summary of the field activities and analytical results are provided in Appendices No. 2 through 4. The first phase of the field investigation involved sampling the sludge and determining the volume of sludge in the ponds. The second phase of the investigation included sampling of soils adjacent to the impoundments and installation of groundwater monitoring wells. The third phase included sampling of the groundwater monitoring wells to determine the concentration of various constituents and the direction of flow of groundwater in the area of the impoundments.

Sludge sampling locations were selected randomly and none were required to be re-located because of safety or accessibility problems. Sampling locations are provided on the figure in Appendix No. 5. The groundwater monitoring wells were installed to obtain representative samples near each impoundment. At each impoundment, the selected well locations were intended to provide one well upgradient and three wells downgradient.

The samples were analyzed in the laboratory for the parameters indicated in the table below. The sludge samples were tested for parameters applicable to screening re-use, treatment or disposal technologies. The soil and groundwater samples were tested for indicators of releases from the impoundments. A list of the parameters and the number of samples tested for each parameter is provided below.

## TABLE 2-1
## SAMPLE PARAMETER SUMMARY

| Location and Type of Sample | Number Samples for Oil & Grease, Heat Content, Water/Solids/Ash and Total Halogen | Number of Samples for Benzene Ethylbenzene Toluene and Xylene | Number of Samples for Total Petroleum Hydrocarbon | Number of Samples for Lead& Chromium | Number of Samples for TCLP | Number of Samples for Skinner List |
|---|---|---|---|---|---|---|
| Guard Basin Sludge | 16 | 0 | 0 | 16 | 2 | 2 |
| Lime Pits Sludge | 8 | 0 | 0 | 8 | 1 | 1 |
| Guard Basin Soils | 0 | 8 | 8 | 8 | 0 | 1 |
| Lime Pits Soils | 0 | 8 | 8 | 8 | 0 | 1 |
| Guard Basin Groundwater | 0 | 4 | 4 | 4 | 0 | 0 |
| Lime Pits Groundwater | 0 | 4 | 4 | 4 | 0 | 0 |
| Equipment Blanks | 0 | 1 | 1 | 1 | 0 | 0 |
| TOTALS | 24 | 25 | 25 | 49 | 3 | 5 |

### 2.2 Sludge Analysis

Samples of the impoundment sludges were analyzed for the parameters included in the above table. Samples were tested to evaluate treatment or disposal options which may be appropriate for closure of the units. A discussion of the significance of each of these parameters is provided in Section 3 of this report. The analytical parameters include the constituents of environmental concern which may be contained in the sludges. These parameters include the Toxicity Characteristics (TC) and the Skinner List compounds. The TC results determined the extractable levels of constituents present.

The following tables provide a summary of the analytical results. Tables containing additional data is provided in Appendix No. 2.

**TABLE 2-2**
**SLUDGE CHARACTERISTIC DATA**

| SAMPLE NUMBER | OIL & GREASE (mg/kg) | WATER (%) | ASH (%) | SOLIDS (%) | HEAT CONTENT (BTU/LB) | HALOGENS (mg/kg) | CHROMIUM (mg/kg) | LEAD (mg/kg) |
|---|---|---|---|---|---|---|---|---|
| GB - 1 | 44,000 | 40 | 56 | 63 | 3,800 | BDL | 180 | 230 |
| GB - 2 | 43,000 | 39 | 53 | 61 | BDL | BDL | 11 | 77 |
| GB - 3 | 65,000 | 39 | 39 | 53 | BDL | BDL | 60 | 340 |
| GB - 4 | 51,000 | 40 | 45 | 53 | BDL | BDL | 160 | 170 |
| GB - 5 | 170,000 | 43 | 19 | 49 | 7,100 | BDL | 1,100 | 56 |
| GB - 6 | 140,000 | 50 | 14 | 42 | 5,900 | 1,200 | 1,400 | 64 |
| GB - 7 | 110,000 | 56 | 14 | 39 | 5,900 | 3,900 | 1,400 | 44 |
| GB - 8 | 140,000 | 71 | 37 | 52 | 4,800 | BDL | 1,500 | 74 |
| GB - 9 | 120,000 | 39 | 29 | 42 | 4,300 | BDL | 1,400 | 72 |
| GB - 10 | 150,000 | 57 | 20 | 33 | 4,800 | BDL | 1,700 | 250 |
| GB - 11 | 68,000 | 42 | 40 | 37 | 5,000 | 6,900 | 160 | 880 |
| GB - 12 | 180,000 | 47 | 29 | 48 | 6,400 | BDL | 1,700 | 40 |
| GB - 13 | 130,000 | 43 | 25 | 38 | 4,300 | 280 | 1,300 | 72 |
| GB - 14 | 35,000 | BDL | 28 | 38 | BDL | BDL | 22 | 84 |
| GB - 15 | 160,000 | BDL | 31 | 44 | 6,100 | BDL | 1,400 | 68 |
| GB - 16 | 140,000 | 46 | 21 | 41 | 3,900 | BDL | 2,800 | 880 |
| LP - 1 | 1,400 | 68 | 9 | 13 | BDL | 650 | 91 | 0.68 |
| LP - 2 | 2,800 | 80 | 7 | 30 | BDL | 1,500 | 19 | 2.60 |
| LP - 3 | 840 | 78 | 10 | 15 | BDL | BDL | 18 | 12.0 |
| LP - 4 | 4,800 | 55 | 21 | 27 | BDL | 490 | 17 | 7.0 |
| LP - 5 | 4,100 | 71 | 23 | 30 | BDL | 420 | 40 | 2.2 |
| LP - 6 | 1,300 | 57 | 26 | 33 | BDL | BDL | 170 | 3.3 |
| LP - 7 | 220 | 71 | 21 | 27 | BDL | 830 | 22 | 0.72 |
| LP - 8 | 1,700 | 65 | 22 | 27 | BDL | BDL | 250 | 4.8 |

## TABLE 2-3
## SKINNER LIST ANALYSIS OF IMPOUNDMENT SLUDGES

| Total Constituents | Concentrations in Composite Samples of Guard Basin and Lime Pit Sludges | | |
|---|---|---|---|
| | Guard Basin Sample 1-8 (mg/kg) | Guard Basin Sample 9-16 (mg/kg) | Lime Pits Sample 1-8 (mg/kg) |
| Barium | 100 | 170 | 87 |
| Cadmium | BDL | 0.92 | 0.9 |
| Chromium | 1200 | 680 | 39 |
| Cobalt | 3.3 | 4.7 | BDL |
| Lead | 47 | 90 | BDL |
| Mercury | 0.21 | 0.33 | BDL |
| Nickel | 62 | 20 | 6.1 |
| Vanadium | 250 | 71 | BDL |
| Benzene | BDL | 1.6 | BDL |
| Ethyl benzene | 4.3 | 6.5 | BDL |
| Toluene | 2.7 | 8.9 | BDL |
| Xylene | 40 | 50 | BDL |
| Anthracene | BDL | 53 | BDL |
| Benzo(a)anthracene | BDL | 74 | BDL |
| Chrysene | 35 | 220 | BDL |
| Fluoranthene | BDL | 50 | BDL |
| 1-Methyl naphthalene | ND | 300 | BDL |
| Naphthalene | 64 | 110 | BDL |
| Phenanthrene | 140 | 390 | 1.3 |
| Pyrene | 61 | 320 | BDL |

Other Skinner List constituents were not detected in the samples.

TABLE 2-4
TCLP ANALYSIS OF IMPOUNDMENT SLUDGES

| Leachable Constituents | Analysis of Composite Samples of Guard Basin and Lime Pit Sludges | | |
|---|---|---|---|
| | Guard Basin Sample 1-8 (mg/l) | Guard Basin Sample 9-16 (mg/l) | Lime Pits Sample 1-8 (mg/l) |
| Arsenic | BDL | 0.011 | BDL |
| Barium | 8.3 | 8.3 | 9.2 |
| Chromium | 1.2 | BDL | BDL |
| Lead | 0.12 | BDL | BDL |
| Benzene | BDL | 0.023 | BDL |
| Methyl Ethyl Ketone | 0.11 | BDL | BDL |
| 2-Methyl Phenol | BDL | 0.08 | BDL |

Other TC constituents were not detected in the samples.

In general, the sludges contain: lead, chromium, mercury and vanadium, 50 to 60 mg/kg volatile organics and up to 1000 mg/kg polynuclear aromatic (PNA) compounds in selected samples. Only very low levels of leachable compounds were detected in the samples. The analytical results and laboratory data sheets are summarized and included in Appendix No. 2.

2.3 Soils Analysis

Soil samples were obtained from borings advanced while installing groundwater monitoring wells. The soils which indicated the highest potential for contamination based on visual observation and screening with an Organic Vapor Analyzer were selected for analysis. Soil samples were analyzed for the following indicators of releases: Total Petroleum Hydrocarbons (TPH), lead, chromium, benzene, ethylbenzene, toluene and xylenes (BETX). In addition to these parameters, composite samples were analyzed for the Skinner List constituents. This limited investigation was to provide an indication of whether further investigations of the area were required. A summary of the analytical results is provided below.

TABLE 2-5
ANALYTICAL RESULTS SOILS
METALS AND ORGANIC INDICATORS (mg/kg)

| Sample Number | Depth (feet) | TPH | Chromium | Lead | Benzene | Ethyl benzene | Toluene | Xylenes |
|---|---|---|---|---|---|---|---|---|
| GB - 1 | 2'-6' | 730 | 15.0 | 48.0 | BDL | BDL | BDL | BDL |
| GB - 1 | 18'-22' | BDL | 7.3 | 3.0 | BDL | BDL | BDL | BDL |
| GB - 2 | 4'-6' | 23,000 | 200 | 96 | 0.50 | 1.5 | 0.27 | 6.9 |
| GB - 2 | 18'-22' | BDL | 13.0 | 6.9 | 0.005 | BDL | 0.006 | 0.003 |
| GB - 3 | 4'-8' | BDL | 8.8 | 12.0 | BDL | 0.004 | BDL | 0.019 |
| GB - 3 | 24'-28' | BDL | 3.5 | 1.8 | BDL | BDL | BDL | BDL |
| GB - 4 | 4'-8' | 3,500 | 19.0 | 900 | 0.035 | 0.003 | 0.30 | 0.017 |
| GB - 4 | 14'-18' | BDL | 16.0 | 11.0 | 0.024 | BDL | 0.019 | BDL |
| LP - 1 | 8'-12' | 27 | 9.2 | 12.0 | 0.005 | BDL | BDL | BDL |
| LP - 1 | 26'-30' | 2,700 | 6.4 | 4.2 | 0.027 | 0.65 | 0.042 | 2.0 |
| LP - 2 | 4'-8' | BDL | 13.0 | 11.0 | 0.008 | BDL | 0.006 | BDL |
| LP - 2 | 22'-26' | 27 | 8.9 | 2.5 | 0.003 | BDL | 0.003 | BDL |
| LP - 3 | 6'-10' | 65 | 12.0 | 4.4 | 0.010 | BDL | 0.005 | BDL |
| LP - 3 | 16'-20' | 20 | 7.7 | 2.1 | BDL | BDL | BDL | BDL |
| LP - 4 | 4'-6' | 110 | 110 | 36.0 | 0.007 | BDL | 0.004 | BDL |
| LP - 4 | 24'-28' | 37 | 6.7 | 2.2 | BDL | BDL | BDL | BDL |

TPH - Total Petroleum Hydrocarbons
BDL - Below Detectable Levels

The soil sample composited from samples collected around the Guard Basin was found to contain traces of volatile organic compounds (less than 1 mg/kg) and low levels of polynuclear aromatic (PNA) compounds (approximately 125 mg/kg). The sample also contained lead at 740 mg/kg and arsenic at 2 mg/kg. Beryllium, cobalt and nickel were also detected in the sample. The soil sample composited from samples collected around the Lime Pits contained traces of volatile organic compounds (approximately 1 mg/kg) and low levels of naphthalene compounds (approximately 6 mg/kg). The sample also contained cobalt and vanadium. The Skinner List analysis is provided in the following table.

## TABLE 2-6
## SKINNER LIST ANALYSIS OF SOILS

| Skinner Analysis | Total Constituent Concentrations in Composite Samples of Soils | |
|---|---|---|
| | Guard Basin Soil (mg/kg) | Lime Pit Soil (mg/kg) |
| Arsenic | 2 | BDL |
| Barium | 140 | 110 |
| Beryllium | 0.34 | BDL |
| Chromium | 8.9 | 27 |
| Cobalt | 13 | 6.5 |
| Lead | 740 | 6.4 |
| Nickel | 13 | 9.9 |
| Vanadium | BDL | 27 |
| Benzene | 0.098 | 0.76 |
| Ethyl benzene | 0.03 | 0.071 |
| Methyl ethyl ketone | 0.021 | 0.18 |
| Toluene | 0.099 | 0.3 |
| Xylene | 0.17 | 0.16 |
| Benzo(a)anthracene | 9.9 | BDL |
| Benzo(b)fluoranthene | 5.3 | BDL |
| Benzo(a)pyrene | 4.6 | BDL |
| Chrysene | 39 | BDL |
| Fluoranthene | 3.5 | BDL |
| Methyl chrysene | 15 | ND |
| 1-Methyl naphthalene | ND | 4 |
| Naphthalene | BDL | 2.1 |
| Phenanthrene | 8.6 | BDL |
| Pyrene | 39 | BDL |

Other Skinner List constituents were not detected in the samples.

## 2.4 Groundwater Analysis

Groundwater samples were collected from each well to evaluate whether waste constituents have been released from these units into the groundwater. A summary of the analytical results is provided below.

**TABLE 2-7**
**ANALYTICAL RESULTS GROUNDWATER**
**METALS AND ORGANIC INDICATORS (mg/L)**

| Sample | TPH | Chromium | Lead | Benzene | Toluene | Ethyl benzene | Xylenes |
|---|---|---|---|---|---|---|---|
| GB - 1 | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| GB - 2 | 1.36 | BDL | BDL | BDL | BDL | BDL | BDL |
| GB - 3 | BDL | BDL | BDL | BDL | BDL | BDL | BDL |
| GB - 4 | 0.83 | BDL | BDL | BDL | BDL | BDL | 0.007 |
| LP - 1 | 1.5 | BDL | BDL | BDL | BDL | 0.009 | 0.015 |
| LP - 2 | 1.0 | BDL | BDL | BDL | BDL | BDL | BDL |
| LP - 3 | BDL | 0.0063 | BDL | BDL | BDL | BDL | BDL |
| LP - 4 | BDL | BDL | BDL | BDL | BDL | BDL | BDL |

BDL - Below Detectable Levels

## 2.5 Sludge Volume Estimate and Description of Impoundments

The volume of sludge was estimated by determining the average sludge depth in each section of the impoundments and multiplying by the area of the impoundment section. The Guard Basin has two sections of approximately equal dimensions. The impoundment is divided in order to divert the flow of water through the impoundment and increase retention time. This results in most of the solids settling out in the first part of the impoundment, causing the volume of sludge in each section to be significantly different. Water is routed to the east side of the Guard Basin and pumped to the wastewater treatment system from the west side.

The Lime Pits are used to de-water sludges generated from the treatment of raw water and receive wastewater from the neutralization of HF used in the alkylation unit. Most of the sludges (approximately 80 to 95%) are generated from the lime softener used to treat raw water so it can be used as boiler feed water. The Lime Pits are operated in such a manner that while one of the two pits is being filled, the other pit is allowing the sludges to dry so they can be removed for disposal. The inactive pit is allowed to dry for approximately one year before removing the sludges for disposal. The north pit was receiving lime softener sludge and the south pit was drying during this sampling event. The south pit had no water standing on the sludge while the north pit was receiving a watery sludge material.

The sludge depth measurements are included in Appendix No. 2. The following table provides an average of the depths measured during the field investigation and an estimate of the volume of sludge contained in each impoundment.

**TABLE 2-8**
**SLUDGE VOLUME ESTIMATE**

| IMPOUNDMENT | EAST/NORTH (average depth/volume) | WEST/SOUTH (average depth/volume) | TOTAL |
|---|---|---|---|
| Guard Basin | 3.4ft/18,050 $yd^3$ | 1.2ft/ 6,370$yd^3$ | 24,420 $yd^3$ |
| Lime Pits | 6.5ft/ 6,620$yd^3$ | 5.5ft/ 5,600$yd^3$ | 12,220 $yd^3$ |

## SECTION 3.0

## SCREENING OF IMPOUNDMENT CLOSURE/REMEDIATION ALTERNATIVES

Clark Oil intends to close the Guard Basin and Lime Pits in an environmentally sound manner which includes potential recycling of the sludges and continued use of the Guard Basin for stormwater detention. Sludge treatment and disposal alternatives which are being considered include: re-use as a fuel substitute, treatment for recovery of re-usable or salable materials, biological treatment, stabilization with on-site encapsulation, and stabilization with off-site disposal.

Issues which must be considered during the screening of each technology include transportation and disposal of any treatment residuals and potential long term environmental effects. These issues greatly affect the economics and logistics of treating or disposing of the large volume of sludge contained in these impoundments.

Samples from the impoundments were tested for parameters which are useful in screening suitable technologies. The preferred disposition of the sludge may include re-use or oil recovery. Based on the preliminary data, our initial screening indicates that the re-use options do not appear viable. The relatively low concentration of hydrocarbons and the presence of metals in the sludges make solvent extraction and combustion less attractive options. These characteristics favor stabilization and disposal.

### TABLE 3-1

### RANKING OF CLOSURE TECHNOLOGIES

| TECHNOLOGY | TECHNOLOGY SUITABILITY | TREATMENT COSTS | POTENTIAL AIR EMISSIONS | OVERALL RATING |
|---|---|---|---|---|
| RE-USE AS FUEL | Moderate | High | High | Low |
| RECOVERY OF OIL | Low | High | Low | Low |
| BIOLOGICAL TREATMENT | Moderate | Moderate | Low | Moderate |
| STABILIZATION AND DISPOSAL | High | Low | Low | High |

Additional discussion of each technology and their ranking is provided below.

### 3.1 Re-Use as a Fuel Substitute

Re-use of the Guard Basin sludges as a fuel substitute is an option which may have significant potential based on the heat content of some sludge samples. The heat content of the Guard Basin sludges ranged from below detectable levels to 7,100 BTU/lb, while the average heat content of the sludges is approximately 3,900 BTU/lb. Use of the Guard Basin sludges as a fuel is considered to be a good candidate technology because the sludges are expected to contain a significant amount of coke fines. Petroleum coke is frequently used as a fuel in boilers and furnaces. The heating value makes the technology worth additional consideration, but some compounds in the sludge may create undesirable air emissions.

When evaluating whether a waste material can be used as a fuel there are a number of parameters which must be considered. The parameters of concern include: heat of combustion, water and ash content, halogen and sulfur content, metals, dewatering and transportation of the material. These parameters help to identify pre-treatment costs, potential air impacts caused by combustion of the material, and residual disposal costs. The metals in the sludge could create an air emission problem in sensitive air zones. The presence of halogens and possibly sulfur in the sludge may also contribute to air emissions.

Re-use of sludges as a fuel substitute requires that the material contain sufficient heat content to warrant combustion. Guidance on the heating value required to recycle sludge as fuel varies. Generally a heating value of 5,000 to 6,000 BTU/lb is the lowest value for sludges fed to a properly designed incineration unit. Sludges with heat contents in this range may require some supplemental fuel to ensure proper combustion. The required heating value will vary depending on the design of the combustion unit and the water content of the sludge.

The ash content of a sludge affects the cost associated with additional treatment or disposal of the residuals. Materials with a high solids content must be burned using special burners or units especially designed for burning sludges. The ash content of the sludge will determine the volume of material requiring disposal after combustion. The disposal cost for the treatment residuals will be determined by the classification of the material and the availability of suitable disposal sites. The ash content of the Guard Basin sludges ranges from 14 to 56 percent with an average of approximately 30 percent.

During combustion, metals and halogens may be volatilized and released to the atmosphere. Metals of concern which have been detected in the Guard Basin sludges include mercury, chromium and lead. Mercury was detected in both composite samples from the Guard Basin at concentrations of 0.21 and 0.33 mg/kg. Lead was detected in concentrations of 40 to 880 mg/kg and chromium from 11 to 2800 mg/kg. The specific halogens detected in the sludge samples were not identified, but are suspected of being chlorine and fluorine compounds since the facility uses chlorine for water treatment and hydrofluoric acid as a catalyst in the Alkylation unit. The facility also handles crude oils with a high sulfur content. Upon combustion, the halogens and sulfur form acid gasses which may require removal prior to discharge to the atmosphere. The halogen content ranged from below detectable levels to 6,900 mg/kg. Treatment of the combustion gases may result in the generation of a wastewater stream or other sludges which require treatment or disposal.

Costs associated with use of waste sludges as fuel include: removal from impoundment, dewatering, transportation, the fee paid to the treatment facility for treatment of the sludges and disposal of the residuals. The fees charged by treatment facilities or fuel blenders are normally determined on a case by case basis depending on the waste characteristics, but are frequently in the range of $500 per cubic yard. In addition to these costs, additional charges may be incurred for testing of the sludge, storage of the material prior to treatment, decontamination testing and ash disposal.

## 3.2 Treatment for Recovery of Oil

Recovery of oil from refinery waste sludges can be an effective means of reducing the volume and toxicity of sludges while recovering a valuable material. Numerous technologies are available for treatment of waste sludges, though few have been demonstrated at a full scale operation. This is in part due to the economics of the processes. The more effective processes cost in the range of $150 to $300 per cubic yard ($yd^3$)[1] of material treated. Under favorable conditions, over 90 percent of the oil may be recovered from the sludge.

Most oil recovery technologies are effective at removing the organic constituents contained in the sludges, but have little effect on the metal constituents. Prior to disposal, treated sludges may require additional treatment to immobilize the metal constituents. Immobilization of the metals contained in sludges is normally accomplished by mixing the material with alkaline stabilization agents. The Lime Pit sludges do not contain significant amounts of oil.

The Guard Basin sludges contain oil (measured as Oil & Grease) in concentrations ranging as high as 18 percent with an average concentration of approximately 10 percent. Recovery of oil from the Guard Basin sludges may net as much as 10,000 barrels of oil. Some of the oil in the sludges may not be in a form which is recoverable using the available technology. Bench scale tests would have to be conducted to evaluate the effectiveness of the technologies on the sludges.

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[1] The EPA Superfund Innovative Technology Evaluation (SITE) report indicates that the cost for the CF System (a solvent extraction technology used to remove organic material from oily sludges and solids) ranged from $148 per ton to $447 per ton of sludge treated. These costs included pre- and post-treatment, but did not include cost for disposal of the final solvent extract.

Costs associated with recovery of oil from waste sludges include: removal from impoundment, dewatering, transportation and the fee paid to the treatment facility. In addition to these costs, additional charges may be incurred for testing of the sludge, storage of the material prior to treatment, decontamination testing and ash and wastewater disposal. The cost of treatment for oil recovery of the Guard Basin sludges is estimated to cost approximately $350/yd^3$. This equates to an equivalent cost of approximately $1,000 per barrel of recovered oil. Stabilization and disposal of the treated sludges in a landfill will still be required. The Lime Pit sludges do not contain a significant quantity of oil and are not considered suitable for this type of treatment. Based on this preliminary screening, recovery of oil from the Guard Basin sludges is not considered to be a viable technology.

### 3.3 Biological Treatment

Biological treatment has been used to effectively treat refinery waste streams for many years. Generally, biological treatment has been used to treat wastewater streams with low concentrations of organic constituents or treatment of sludges in land treatment units. Other variations of biological treatment have been used to successfully treat refinery waste sludges. The Guard Basin sludges appear to be suitable for biological treatment. The Lime Pit sludges do not contain significant amounts of oil and are not considered suitable for this type of treatment.

Biological treatment of the Guard Basin sludges in a land treatment unit (landfarm) would require a large area based on the slow degradation rates predicted for the type of organic compounds detected in the sludges. The analysis did not identify most of the organic compounds in the sludges (Oil & Grease in the range of 10 to 15 %, with only 300 to 1,500 mg/kg (0.03% to 0.15%) identified compounds). The compounds identified were primarily Polynuclear Aromatic compounds (PNA's). PNA's typically have biodegradation half-lives in the range of 6 months to one year.

A tank based activated biological treatment system may be suitable for treatment of the sludges as it is more aggressive than land treatment. Nutrients and any additional microorganisms which may be required to stimulate biological activity can be added to the sludge very effectively using this system. This technology has been demonstrated to be effective at treating waste sludges, but additional testing is required to adequately evaluate the suitability for treatment of the Guard Basin sludges.

The biological treatment technologies are effective at removing the organic constituents contained in the sludges, but have little effect on the metal constituents. Prior to disposal, treated sludges may require additional treatment to immobilize or remove the metal constituents. Immobilization of the metals contained in sludges is normally accomplished by mixing the material with alkaline stabilization agents.

Biological treatment of the Guard Basin sludges is not considered to be a suitable alternative because of the experimental nature of this process for treatment of impoundment sludges. The variability in composition of the sludges would make operation of this type of system difficult. This technology has not, to our knowledge, been demonstrated on a large scale impoundment sludge remediation project. We do not recommend pursuing it further at this stage of the project.

3.5 Stabilization

Stabilization, by the dewatering or blending with other materials, of waste sludges has been demonstrated to be an effective treatment for refinery waste streams. Stabilization immobilizes metal and other waste constituents reducing the potential for waste constituents to leach from the waste. This technology is well suited for the Guard Basin and Lime Pit sludges because of the relatively low concentration of organic constituents. The Lime Pit sludges, which were not subjected to laboratory testing, do not have significant organic content.

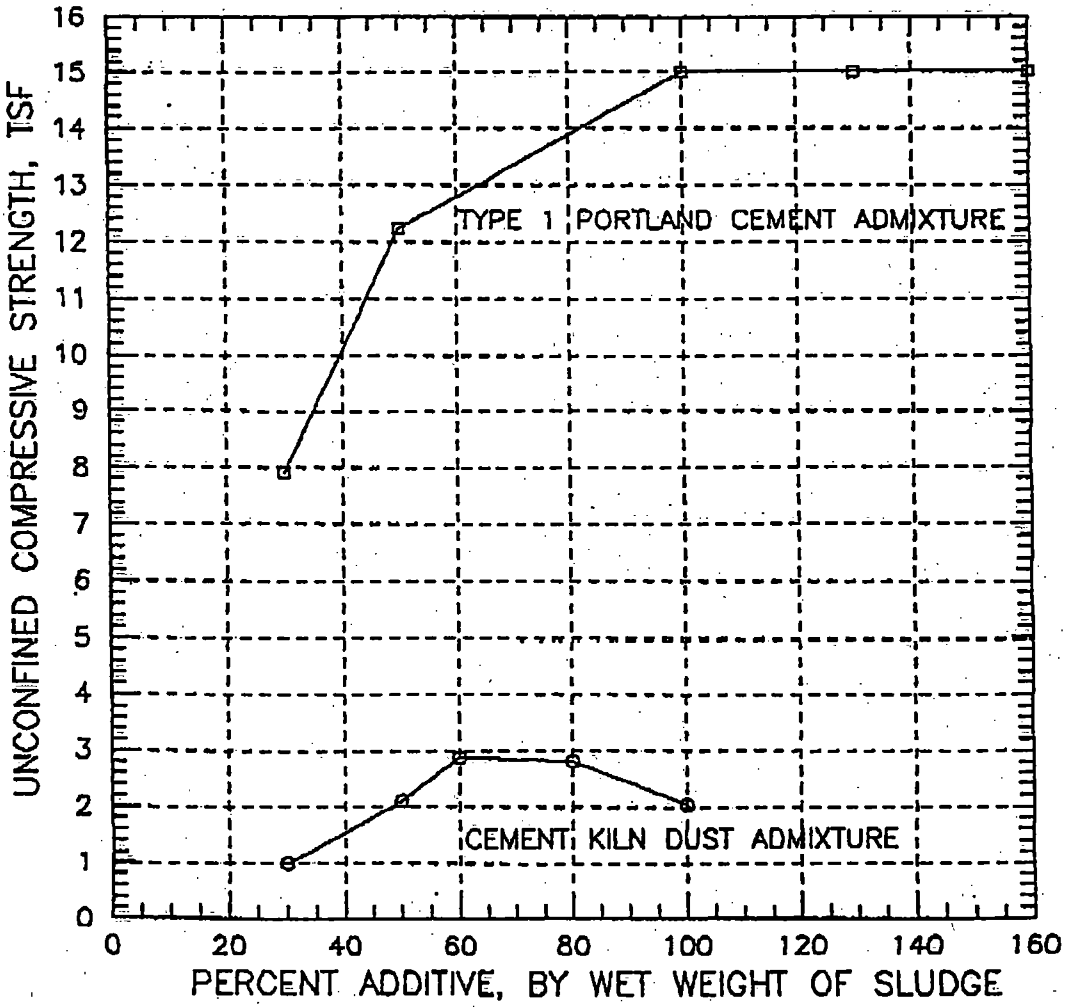
Stabilization testing of Guard Basin sludges conducted in the laboratory indicate that stabilization may be effective on these sludges. The stabilized sludges were tested for unconfined compressive strength as an indicator of the effectiveness of each additive. One sample of the stabilized sludge which appeared to have sufficient strength was tested to determine the concentration of leachable metals in the sample.

Sludges from the Guard Basin were tested to determine whether stabilization with cement kiln dust (CKD) or Portland cement were effective. The results of this testing are presented in Table 3-1. Samples of sludges mixed with the varying quantities of stabilization agents were tested for unconfined compressive strength. The stabilized samples had significant strength and did not leach any TC metal constituent except barium.

The Guard Basin sludges contain as much as 18 percent organic material with an average concentration of 10 percent. The low levels of organic constituents found in the material did not appear to adversely affect stabilization. The unconfined compressive strength of the samples stabilized with Portland cement increased with the percentage cement until the limit of the test instrument was exceeded. The CKD did not appear to be as effective at achieving strength in the samples which may attributable to a lack of adequate moisture.

SWL

UNCONFINED COMPRESSIVE STRENGTH VS ADDITIVE CONTENT
IMPOUNDMENT SLUDGE STABILIZATION STUDY
BROWN AND CALDWELL
HOUSTON, TEXAS
SwL PROJECT NO. 93-143




NOTES:

1. COMPRESSION TESTS HALTED AT 15 TSF DUE TO PROVING RING CAPACITY.
2. PERCENT ADDITIVE COMPUTED AS PERCENTAGE OF WET WEIGHT OF SLUDGE AFTER DECANTING STANDING WATER FROM SAMPLE BUCKETS.

Stabilization has been demonstrated to work effectively on sludges containing metal constituents, but may be adversely affected by organic constituents contained in the waste. Some stabilization agents have been demonstrated to effectively immobilize organic constituents, though tests are not conclusive[2]. The organic materials in sludges may inhibit the stabilization process or the organic constituents may not be adequately immobilized. Several companies market specialty stabilization additives which appear to perform on sludges with organic content as high as 25 percent.

Portland cement and cement kiln dust (CKD) were used as stabilization agents for this testing. The specialized or proprietary agents which allow stabilization of materials with a high organic content were not used during this testing. Testing was conducted at a variety of ratios in order to evaluate the effectiveness and relative cost of stabilization. Stabilization using Portland cement based technologies are expected to cost in the range of $100 per cubic yard[3].

Off-site disposal of the sludges requires transportation of the material to a licensed disposal site. The cost for transport and disposal of the stabilized sludges at the nearest acceptable facility will depend on the level of waste constituents allowed in waste or extract and the distance to the disposal facility. If the stabilized waste meets all applicable disposal restrictions, disposal costs in the range of $250 per ton are anticipated.

On-site disposal of the stabilized impoundment sludges requires that a disposal cell be constructed to contain the treated sludges. Treatment of the sludges includes stabilization and placement in an on-site disposal cell. The cell is required to provide a barrier to migration of constituents caused by infiltration of stormwater or groundwater.

Stabilization and on-site disposal of the impoundment sludges appears to be the most cost effective and environmentally sound method of closure for the Guard Basin and Lime Pits sludges. Treatment of the sludges using stabilization minimizes the risk of waste constituents leaching from the waste and managing the waste on-site eliminates the risks and costs associated with transportation of the waste.

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[2] The SITE report on the HAZCON Solidification Process contains information regarding the immobilization of organic constituents using stabilization processes.

[3] The HAZCON Solidification Process is estimated to cost approximately $100 per ton of contaminated soil treated.

# SECTION 4.0

# SITE CONDITIONS

The investigation included sampling of soils and groundwater around the impoundment to evaluate whether waste constituents may have been released to the environment. Soils were sampled at various depths at the locations selected for installation of groundwater monitoring wells. Groundwater monitoring wells were installed both upgradient and downgradient of the Guard Basin and the Lime Pits. The geology and hydrogeology of the area around the impoundments is summarized below. The analysis of soil and groundwater samples collected during the investigation are discussed below.

## 4.1 Hydrogeology

The regional and local hydrogeology were investigated in order to assess potential pathways of migration from the impoundments. The soils are generally sandy in the area of the refinery and groundwater is encountered approximately 35 feet below the ground surface. These conditions can affect the procedures used to close the impoundments.

### Regional Geology/Hydrogeology

Hartford, Illinois lies in the northern part of the valley bottom of the Mississippi River. The area of the Mississippi Valley bottom located between Dupo and Alton, Illinois is locally known as the American Bottoms and covers approximately 175 square miles. Water in the area of the American Bottoms typically is obtained from three sources; glacial drift, bedrock, and valley fill aquifers.

Thin glacial drift deposits are located on the upland adjacent to the American Bottoms. The glacial drift deposits are comprised of glacial till overlain by 50 feet or more of loess. Locally, thin sand and gravel beds may supply enough water for domestic use. The sand and gravel beds are typically found near the base of the fill.

The bedrock aquifers are comprised primarily of limestone and dolomite with lesser amounts of sandstone and shale. Although the bedrock aquifers may be capable of producing large quantities of water, they are currently of lesser importance in the American Bottoms because they often produce highly mineralized water and the shallow water occurring in the valley fill is easily accessible.

The valley fill consists of both alluvium and glacial outwash deposits. The thickness of these deposits ranges from approximately 40 feet to 160 feet. The valley fill deposits consist of sand, gravel, silt, clay, and pebbly clay. The more permeable sands and gravels are water yielding. The valley fill produces the greatest quantities of water used in the area. The principal means of groundwater recharge to the valley fill is seepage from rainfall and floods, and percolation from the Mississippi River.

Local Geology/Hydrogeology

The Clark facility lies upon the valley fill deposits. According to Illinois Geological Survey Report of Investigations 191, the thickness of the valley fill in the Hartford area is approximately 120 to 160 feet. The depth of borings completed during this investigation range from 40 to 42 feet.

Based upon lithologic descriptions completed by Heritage Remediation Engineers, the stratigraphy in the vicinity of the lime pits and Guard Basin consists of eight to 24 feet of interbedded silt, silty clay, clayey sand, and sandy silt overlying 10 to 33 feet of medium to coarse grained sand. A sandy gravel layer was encountered at the base of borings GB-1 (36 to 40 feet) and GB-2 (32 to 40 feet). A two-foot-thick sandy gravel layer was encountered at a depth of 22 to 24 feet in boring LP-2.

Groundwater was encountered in each well completed during this investigation. The depth to groundwater ranges from 31 to 35 feet. Based on groundwater elevation measurements, groundwater flow in the vicinity of the Guard Basin is to the north-northeast with a gradient of approximately 0.003 feet per foot. Groundwater in the vicinity of the lime pits appears to flow to the southeast with a gradient of approximately 0.01 feet per foot. The differences in groundwater flow direction and gradient between the lime pit and Guard Basin areas indicate unidentified controls on groundwater flow may exist. The limited groundwater data collected during this investigation is not sufficient to adequately characterize groundwater flow conditions in the vicinity of the Lime Pits and Guard Basin. Preliminary groundwater flow patterns are shown on Figure 4-1 in Appendix No. 4.

Regional studies of groundwater flow patterns conducted by the Illinois State Water Survey in 1985 indicate extensive pumping of groundwater in the area of the Clark Oil refinery. This pumping has caused the development of a cone of depression and anomalous flow patterns in the Hartford/Roxanna area. The effects of this pumping on groundwater flow patterns in the area of the Guard Basin and Lime Pits will be investigated.

4.2 Releases to Soils

Soil samples were obtained at various depths around each of the units to determine whether waste constituents have been released. The soil samples which indicated the highest potential for contamination were selected for analysis. Samples were collected from depths ranging from 14 inches to 30 feet below the surface. A composite soil sample from each of the impoundment areas was prepared and analyzed for the Skinner List constituents. The results of these analyses are provided in Appendix No.2.

The Total Petroleum Hydrocarbon (TPH) analysis is used as an indicator of hydrocarbon releases. The test is subject to interferences for non-hydrocarbon materials and background concentrations are frequently in the 30 to 50 mg/kg range. Analysis of soils around the Guard Basin and Lime Pits were found to have levels of TPH as high as 23,000 mg/kg. Most of the soil samples which contain elevated levels of TPH were collected at depths of less than eight feet. Some of these shallow samples also had elevated levels of lead or chromium. One soil sample collected at a depth of 30 feet contained high levels of TPH.

Soil samples were also tested to determine the levels of specific constituents which are frequently used as indicators of releases from refinery waste management units. The specific constituents which were tested for include lead, chromium (metals), benzene, ethyl benzene, toluene and xylene (BETX). Some of these shallow samples which contain elevated levels of TPH also had elevated levels of lead or chromium. These samples were collected from depths of less than eight feet. None of the deep samples had levels of lead or chromium above normal background levels. Composite soil samples were analyzed for the Skinner List constituents[4].

The waste constituents detected in the soil samples were primarily found at depths of less than eight feet. The Guard Basin normally operates at a level approximately 10 feet below the ground surface. This level changes depending on the volume of rainfall and other factors, but very rarely approaches grade level. Based on the fact that the waste constituents were discovered at such shallow depths indicates that they may not be related to operation of the impoundments.

<u>Lime Pit Soils</u>

Analysis of discrete soil samples from around the Lime Pits indicated only one area near the surface with elevated levels of waste constituents. This sample was collected from an area south of the Pits. A sample collected at a depth of thirty feet also showed elevated levels of TPH and volatile aromatic compounds. A composite sample which was analyzed for the Skinner List constituents contained levels of BETX and metals comparable to the grab samples. None of the PNA compounds were detected in the composite sample.

The soils to the north and west of the Lime Pits contained low concentrations of TPH (27 to 110 mg/kg) and volatile organic constituents (BDL to 3 mg/kg) except the sample at a depth of 30 feet. At 30 feet, the hydrocarbons (2,700 mg/kg TPH) found in the soils may be the result of prior releases of hydrocarbons from on-site or off-site sources.

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4 The Skinner List is taken from the EPA manual "Guidance Document for Delisting of Refinery Waste".

Sample location LP-4, located south of the Pits, contains elevated levels of chromium (110 mg/kg) at 5 feet. The Lime Pit sludges contain chromium, but only two samples contain in excess of 100 mg/kg and half of the samples contain less than 25 mg/kg. The chromium in the Lime Sludge is expected to be in an insoluble form which is not likely to migrate.

The Skinner List analysis of the Lime Pit soils composite detected volatile organic compounds and low levels of two of the semi-volatile organic constituents. Several of the Skinner List metals were also detected in the Lime Pit samples. The metals were found at concentrations which are found in soils not impacted by industrial activities[5].

Guard Basin Soils

Analysis of discrete soil samples from around the Guard Basin indicated several areas near the surface with elevated levels of TPH and metals. The analysis of the discrete samples for volatile organic compounds did not show concentrations higher than 7 mg/kg, with most samples containing below 1 mg/kg of the volatile organic compounds combined. The composite sample from the Guard Basin area contained several of the organic constituents on the Skinner List and elevated levels of some metals.

The concentration of the volatile organic compounds in the composite sample are comparable to the concentrations detected in the grab samples. The concentration of semi-volatile organic constituents found in this sample (approximately 125 mg/kg) are higher than those detected in the composite sample taken from around the Lime Pits.

The semi-volatile organic constituents are not generally considered mobile in soils and are unlikely to have migrated from the Guard Basin. These compounds are present in the upper eight feet of soils, above the normal operating level of the Guard Basin. Subsequent sampling efforts will address these surficial areas to better understand the distribution of TPH and metals.

## 4.3 Releases to Groundwater

Representative groundwater samples were collected from each of the monitoring wells for analysis. Samples were tested to determine the concentration of the specific constituents lead, chromium (metals), benzene, ethyl benzene, toluene and xylene (BETX). Most of the samples did not contain any these constituents, though trace levels (below 15 ug/L) were detected in three of the samples. The sample from monitoring well GB-4

[5] Background concentrations of metals are presented in USGS Geological Professional Paper 574-D.

contained 7 ug/L of xylene and the sample from monitoring well LP-1 contained 15 ug/L of xylene and 9 ug/L of ethylbenzene. The sample from monitoring well LP-3 contained 6.3 ug/L of chromium.

As discussed above in the hydrogeology section, the groundwater flow gradient at the facility appears to be complex and has not been fully defined. Subsequent sampling events will help to define the groundwater flow and gather more groundwater data. The very low levels of the indicator parameters detected in the groundwater samples indicates that the Guard Basin and Lime Pits have not had a significant impact on groundwater at the facility.

### 4.4 Additional Investigations

Additional investigations are proposed to further define the waste constituents detected in the soils and groundwater in the area of the surface impoundments. The investigations will focus on identifying potential sources of constituents in soils and defining the extent of affected groundwater. Soil samples will be collected where additional groundwater monitoring wells are installed. A plan for collecting additional soil samples will be prepared and submitted to the IEPA for consideration.

The groundwater flow patterns in the area of the impoundments appear to be complex and may be affected by extensive pumping around the refinery and other factors. Additional measurement of the groundwater elevations in the newly installed monitoring wells will be conducted monthly. Additional wells which may be suitable for establishing facility wide groundwater flow patterns will be identified and monitored with the new wells. Additional groundwater monitoring wells will be installed and soil samples collected for analysis. The additional wells will be used to further define the groundwater flow patterns and determine whether waste constituents are present below the impoundments.

## SECTION 5.0

## CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER STUDIES

This investigation and review of closure technologies is intended to provide a preliminary evaluation of the Guard Basin and Lime Pits. The conclusions presented here are based on this preliminary information and are subject to change. Additional investigations and discussion with the IEPA will be pursued to ensure that the proper decisions are made.

### 5.1 Impoundment Closure Procedures

The sludges contained in the Guard Basin and Lime Pits have been sampled and analyzed to determine the physical and chemical composition of the material. This information was then used to conduct a preliminary screening of disposal or re-use technologies. Those technologies which appeared applicable were considered. The quantity of sludge in each of the impoundments has been estimated and the physical characteristics determined.

The results of the sludge analysis and testing indicate that on-site disposal of the sludges is the most cost effective closure option for the Guard Basin and Lime Pits. The Lime Pit sludges contain such low concentrations of organics, that disposal in a landfill is the only suitable disposal method. The Guard Basin sludges also appear to be suitable for landfill disposal after stabilization because the sludges leach only low concentrations of metals without stabilization and only low levels of barium after stabilization. The organic compounds in the sludge did not interfere with the stabilization reaction and the compounds detected are not considered to be mobile in the environment. Off-site disposal of the stabilized sludges is not proposed because of the risks and costs associated with transportation and disposal of the waste. Mixing of the Lime Pit and Guard Basin sludges and disposal in an on-site landfill is the disposal method proposed by Clark.

### 5.2 Releases to Soils and Groundwater

Potentially affected soils and groundwater in the area of these impoundments have been sampled to determine whether constituents of concern are present in the area of the Lime Pits and Guard Basin. Constituents detected in the soil samples were primarily found at depths of less than eight feet. The constituents discovered do not appear to be related to the operation of the impoundments. This assessment is based on the normal operating level of the Guard Basin being below the depth of the samples. The chromium detected in the area of the Lime Pits did not appear to have come from that unit based on the concentration in the sludge and in the soils. In addition the chromium found in the sludge is expected to be in a relatively immobile form.

Groundwater samples from the area of the impoundments contain trace levels of indicator constituents. The source of these constituents has not been identified because the groundwater flow patterns in the area of the impoundments has not been fully defined. The direction of flow appears to be different at each of the impoundments indicating the need for additional investigation.

## RECOMMENDATIONS

Clark proposes to conduct additional investigations in the area of the impoundments to gather more data and address any remaining concerns of IEPA as identified in their March 19, 1993 letter. Clark will prepare a plan for additional investigations which address the concerns expressed in the IEPA letter of March 19, 1993 and any additional concerns resulting from this report within three weeks of receiving IEPA's comments on this report.

## TABLE OF CONTENTS
## GUARD BASIN AND LIME PITS SAMPLING AND ANALYSIS PLAN



## APPENDICES

## 1.0 INTRODUCTION

The Clark Oil and Refining Hartford Refinery (Clark Oil) located in Hartford, Illinois operates surface impoundments where wastewater and stormwater treatment sludges are generated. These impoundments are identified as the Guard Basin and the Lime Pits. These impoundments may receive oily wastewater during dry weather periods and generate the hazardous waste stream - Primary Sludge (F037 and F038). Clark Oil has prepared this Sampling and Analysis Plan to provide procedures for sampling and analysis of the sludges contained in the Guard Basin and Lime Pits and to determine whether waste constituents have been released from these units. The location of the impoundments is shown on Figure 1.

The sludges contained in the impoundments will be evaluated for purposes of waste management, disposal or re-use. Based on the findings of this program, closure alternatives and a closure plan will be prepared for the impoundment. The quantity of sludge and affected soils associated with each of the impoundments will be estimated. This plan also describes the procedures to characterize potentially affected soils and groundwater in the area of these impoundments. The hydrogeology of the area around the Guard Basin and Lime Pits will be characterized during this program and groundwater samples will be obtained for analysis. The findings of the program will be summarized in the final report with a discussion of the condition of the soils and groundwater in the area of the impoundments.

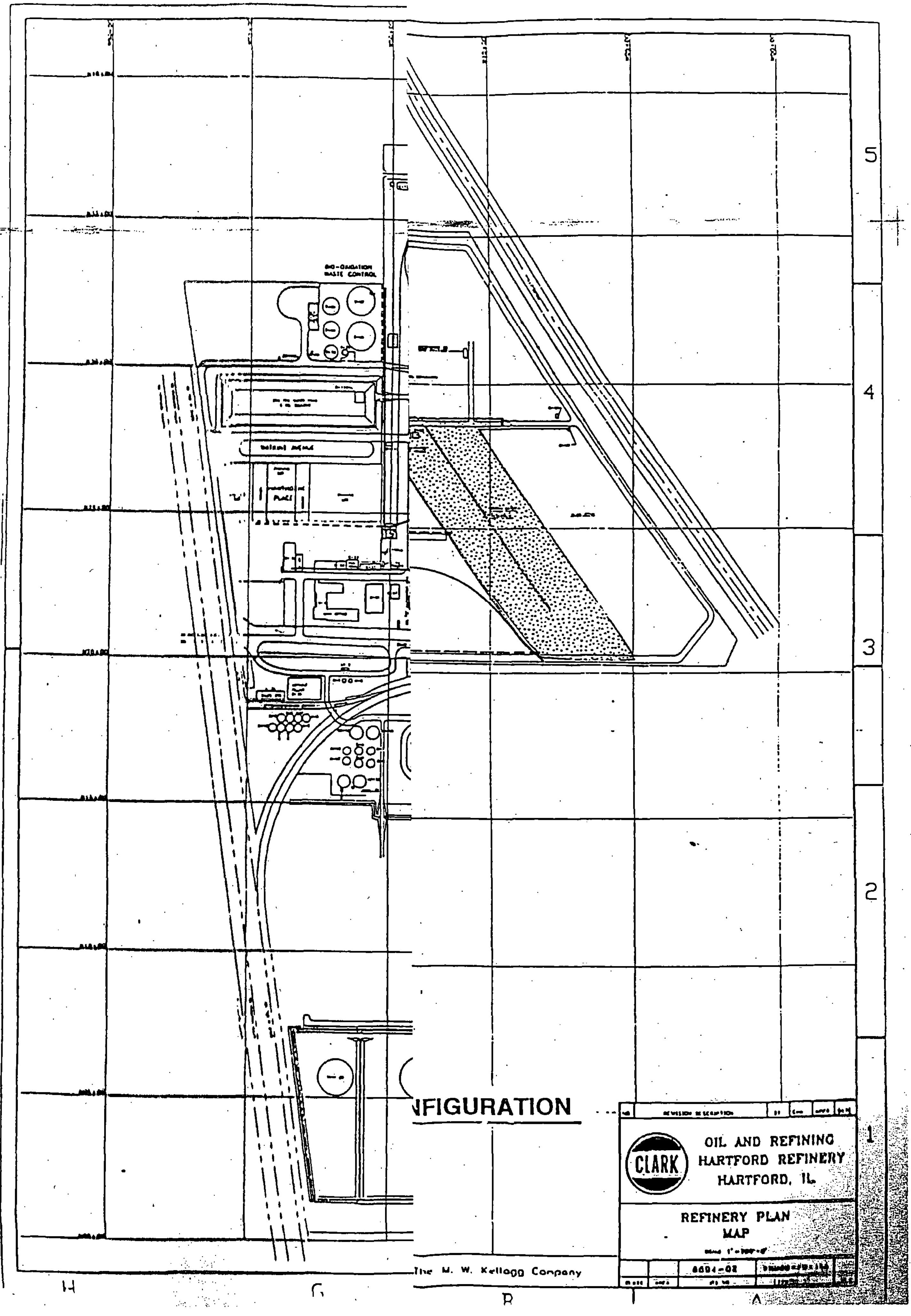
# APPENDIX NO. 1

# SAMPLING AND ANALYSIS PLAN

# CLARK OIL AND REFINING

## GUARD BASIN AND LIME PITS SAMPLING AND ANALYSIS PLAN

NOVEMBER 1992



BIO-OXIDATION WASTE CONTROL
PLACE
NFIGURATION
CLARK
OIL AND REFINING
HARTFORD REFINERY
HARTFORD, IL.
REFINERY PLAN
MAP
The M. W. Kellogg Company
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4
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A

## 2.0 IMPOUNDMENT SAMPLING PLAN

This plan details procedures which will be used to sample the sludges contained within the Guard Basin and Lime Pits and evaluate potential treatment or re-use alternatives. Alternatives which are being considered include: stabilization and on-site encapsulation, stabilization and off-site disposal, re-use as a fuel substitute, treatment for recovery of oil and biological treatment. Samples will be collected and analyzed for parameters which will assist in evaluation of the suitability of these various technologies.

### 2.1 Sampling Locations

Clark Oil proposes to sample and test sludges from the impoundments in order to estimate the volume of sludge and evaluate potential treatment or re-use alternatives. Samples will be obtained from random locations within the impoundments. The locations will be selected by establishing a grid on 35 foot centers and using randomly generated numbers to select the sample locations. If a selected location is inaccessible or presents unnecessary hazards to the sampling team, it will be discarded and another selected.

Clark is proposing to obtain samples for analysis at thirty locations within the Guard Basin and fifteen locations within the Lime Pits. These locations will provide representative samples from each impoundment. The samples obtained at each location will include material from the sludge/water interface to the depth at which a hard bottom is reached. It is anticipated that the impoundments may extend to as much as fifteen feet below grade. This method will collect samples which take into account the vertical variations or layering of the material.

Samples will be collected for chemical and physical analysis as well as stabilization testing and testing to evaluate potential recovery or re-use alternatives. Some preparation of the samples in the field may be appropriate to ensure that the samples are representative. Preparation may include allowing some of the sludge to settle and removing excess water prior to shipping the samples to the laboratory.

### 2.2 Selection of Test Parameters

Clark Oil is proposing that samples be tested to evaluate the following technologies: stabilization and on-site encapsulation, stabilization and off-site disposal, re-use as a fuel substitute, treatment for recovery of oil and biological treatment. The preferred disposition of the sludge will include re-use or oil recovery. Currently the re-use options which appear to hold potential include the use of the de-watered sludge as a fuel substitute and solvent extraction of oil contained in the sludges. Testing to evaluate the heat content and the quantity of recoverable oil contained in the sludges will be conducted. The test parameters listed below are included to evaluate the options discussed and other options may be discovered based on the sludge analysis.

Clark Oil will test samples of the sludges contained in the impoundment for the following:

| ANALYTICAL PARAMETERS | NUMBER OF SAMPLES |
|---|---|
| FUEL CHARACTERISTICS | |
| Oil/Water/Solids/Ash | 24 |
| Heat Content (BTU/lb) | 24 |
| Halogen Content | 24 |
| Metals | 24 |
| RECOVERABLE OIL CONTENT | |
| Oil/Water/Solids | * included above |
| WASTE CONSTITUENTS | |
| Skinner List Constituents | 3 |
| Toxicity Characteristics | 3 |
| WASTE STABILIZATION | |
| Oil/Water/Solids | * included above |
| Stabilization Testing | 3 |
| Toxicity Characteristics | 1 |
| BIOLOGICAL TREATMENT | |
| Nutrients (N-P-K) | 3 |

The Oil/Water/Solids/Ash test will be used to determine the water content, the extractable oil content, the total solids content and the non-volatile solids content of the sludges. The procedure used to conduct this test is specifically designed to evaluate sludges for re-use and stabilization options. This test uses a combination of EPA SW-846 Test Methods for Method for Evaluating Solid Waste and American Society of Testing and Materials (ASTM) methods. The Oil test is SW-846 Method 9071; the Water test is ASTM Method D-95; the Solids test requires a solvent removal of the oil and water, filtering and gravimetric determination of solids content; and the Ash test requires heating the sample to 500° to drive off all other fractions.

The heat content of the sludges will be determined using a Parr Bomb calorimeter. The bomb test will also be used in evaluating the halogen content when combined with the ASTM Test Method D-808. The metals in the sludges will be determined using the EPA Method 7191 and Method 7421 described in the EPA document SW-846.

Analysis for the Skinner List constituents will be conducted by an EPA approved laboratory using the protocol provided in the most current revision of the EPA document SW-846. A list of the constituents included in the Skinner List is provided in Appendix No. 3.

The Toxicity Characteristics (TC) procedure includes extraction using the TCLP and analysis for metals and organics. The protocol is included in the Federal Register dated August 2, 1990.

The stabilization testing procedure will be conducted in the Brown and Caldwell laboratories in California. Stabilization agents (cement kiln dust and boiler flyash) will be mixed with the de-watered sludges and allowed to cure. The strength of the stabilized mixture will then be tested using a pocket penetrometer or vane type shear strength testing device. These methods are commonly used to evaluate soils during geotechnical investigations.

2.3 <u>Sampling and Volume Estimation Procedures</u>

Samples of the impoundment sludges will be collected at locations selected using the procedures described above. The thickness of sludge will be determined at each of the sample locations. Sampling may have to be conducted from boats, though other methods will be investigated. Other potential methods include using a dredge hoisted by a crane or a by a sampling crew hoisted in a basket by a crane. It may be possible to collect some samples from the bank of the impoundments or from existing structures. The sampling method selected will ensure that representative samples are collected. While gathering the samples, soundings of the impoundment bottom and sludge thickness will also be obtained.

Sludge samples will be obtained using a dredge or by pushing a section of two inch diameter PVC pipe through the sludge until a hard bottom is reached. At each location, the depth that sludge was first encountered and the total depth will be recorded in the field log. The sampling device or section of pipe will be retrieved and the sludge and water removed. The sampling team will remove as much of the water as possible and place only the sludge in the sample containers. The solids which remain suspended can be treated or removed in the wastewater treatment system so the sampling will focus on the denser sludges.

The volume of sludge will be estimated by determining an average depth in each section of the impoundments and multiplying by the area of that section. Factors will be developed to estimate the volume which the sludge will occupy when de-watered.

## 3.0 SOIL AND GROUNDWATER SAMPLING PLAN

Clark Oil is proposing to obtain soil samples and install groundwater monitoring wells in the area of the impoundments to determine whether waste constituents have been released to the environment. The soil samples will be obtained while installing the monitoring wells. The location of the monitoring wells will be determined based on local groundwater flow patterns. Clark Oil will attempt to locate the wells so that there are at least one up gradient and three down gradient wells at each impoundment.

### 3.1 Sampling Locations

Sampling locations will be selected based on the assumed direction of groundwater flow. Eight sampling locations are proposed with at least three locations down gradient of each impoundment. The soil samples will be obtained at the locations selected for installation of the monitoring wells. The investigation will attempt to determine the lateral extent of any constituents which may have migrated from the units.

Soil Sampling

Clark Oil proposes to sample and test soils from the area near the impoundments in order to determine whether waste constituents have been released from the impoundments. Soil sampling will be conducted at locations selected for installation of groundwater monitoring wells. The borings will be continuously sampled for geological logging and to identify strata which may be affected by releases. Samples will be taken for laboratory analysis at varied depths in order to determine the vertical extent of the released material. Two soil samples will be taken from each boring location. The samples will be taken at those depths which appear to have the most potential to contain waste constituents. The determination of sample depth will be based on field evaluation of the soil cores.

The soil cores will be visually observed in the field for evidence of waste constituents which may have been released from the impoundments. The cores will also be scanned using an Organic Vapor Analyzer (OVA) or other device which can detect organic vapors and provide indicators of waste constituents. The soil cores which appear to have the highest concentrations of waste constituents will be selected for analysis. The soil cores will be examined in the field by a Professional Geologist who will log the soil classification based on the Unified Soil Classification System. The geologist will also record observations regarding visual or olfactory evidence of waste constituents in the soils

The drawing of the impoundments included in Appendix No. 1 shows the proposed sample locations. The sample locations selected are based on the expectation that groundwater flow from the area of the impoundments is toward the Mississippi River.

Groundwater Sampling

Clark Oil is proposing to install groundwater monitoring wells in the uppermost aquifer located down gradient of the impoundments to determine whether releases to groundwater have occurred. The proposed locations for the monitoring wells are provided in Appendix

No. 1. Groundwater monitoring well installation and development procedures are provided in Appendix No. 2. Monitoring well sampling procedures are provided below.

3.2 Selection of Test Parameters

Clark Oil is proposing that Total Petroleum Hydrocarbons (TPH), lead, chromium, benzene, ethylbenzene, toluene and xylene (BETX) be used as indicators of releases from the impoundments. The Petroleum Hydrocarbon analysis is capable of detecting the "oil" which is processed at the facility. The specific compounds listed above are those which are frequently identified as being present in refinery waste streams. Soil and groundwater samples will be analyzed for the same set of parameters.

A total of 16 soil samples are proposed to be analyzed for TPH, chromium, lead and BETX. Also 2 composite soil samples will be analyzed for the Skinner List constituents[1]. These samples are also intended to define the limits of the contamination (if any) and delineate those areas which have not been affected by releases.

**TABLE I**
**SAMPLE PARAMETER SUMMARY**

**SOIL SAMPLES**

| | TPH | Metals | BETX | Skinner |
|---|---|---|---|---|
| Grab Samples | 16 | 16 | 16 | 0 |
| Composite Samples | 0 | 0 | 0 | 2 |

**WATER SAMPLES**

| | TPH | Metals | BETX | Skinner |
|---|---|---|---|---|
| Groundwater | 8 | 8 | 8 | 0 |
| Equipment Blanks | 0 | 1 | 1 | 0 |

*BETX - Benzene, Ethylbenzene, Toluene and Xylene
*TPH - Total Petroleum Hydrocarbon

[1] *The Skinner List is taken from the EPA manual "Guidance Document for Delisting of Refinery Waste" and is included in Attachment 2*

Sample Analysis

The soil samples will be subjected to laboratory analysis for Petroleum Hydrocarbons, chromium, lead and BETX. Chemical analysis will be conducted by a laboratory approved by the EPA using the protocol provided in the most current revision of the EPA document SW-846.

Laboratory Testing of Samples and Quality Assurance and Quality Control (QA/QC)

The EPA approved testing laboratory will follow the EPA SW-846 testing protocol. Clark Oil will require that the testing laboratory follow the laboratory procedures set forth in EPA's Test Methods for Method for Evaluating Solid Waste, and Methods for Chemical Analysis of Water and Waste or procedures approved by the EPA Regional Administrator.

The Petroleum Hydrocarbon test is EPA method 418.1 and is referenced in EPA 600/4-79-020. Total Chromium and Total Lead content will be tested for using EPA Method 7191 and Method 7421 described in the EPA document SW-846.

The soil samples will also be tested for the presence of four volatile organic compounds, benzene, ethylbenzene, toluene and xylene. The soils will be tested using the procedures outlined in SW-846 Method Number 8240 "GC/MS for Volatile Organics". Analysis for the Skinner List constituents will be conducted using the SW-846 protocol. A list of the constituents included in the Skinner List is provided in Appendix No. 3.

The QA/QC program must include the following checks to ensure date validity:

1) Chain-of-custody completion;

2) Sample handling procedures after sample shuttles are received;

3) Completion of Laboratory Logbook;

4) Analytical procedures used;

5) Reporting of Low and Zero Concentration Values (detection limits);

7) Procedures for handling missing data;

8) Statistical procedures used on Outliers and detection limit values;

9) Procedures used for reporting units of measurement and methods used in finding ambiguous and incorrectly reported values; and

10) Methods used in tracking sample results and final laboratory reports.

3.3 Soil Sampling Procedures

Soil samples will be obtained while installing the groundwater monitoring wells. The wells will be installed using a hollow-stem auger drilling rig and the soil samples will be collected in advance of the drill auger using shelby tubes or split spoon samplers. Samples for geological classification will be obtained continuously in front of the drill bit. The individual soil samples selected for analysis will be placed in separate clean glass jars and labeled in accordance with the procedures presented in this section.

Grab samples will be taken for TPH, metals, BETX and the Toxicity Characteristics (TC) and composite samples will be analyzed for the Skinner List constituents. Most samples will be grab samples in order to minimize the handling of each sample and to eliminate any potential dilution of samples caused by compositing.

Composite samples to be analyzed for the Skinner List Constituents will be homogenized prior to placing them in sample bottles. Homogenation will be accomplished by thorough mixing of the sample in a stainless steel bowl using a stainless steel spoon. After initial mixing, the sample will be quartered, mixed, re-combined and thoroughly mixed again. The homogenizing bowl and spoon as well as hand augers will be decontaminated between each sample collection. For the volatile portion, small samples obtained at each location will be placed in the sample bottle (VOA) and the cap replaced between locations. This procedure will minimize loss of the volatile organic compounds which may occur if the samples are exposed to the atmosphere while compositing. The samples obtained for organic constituent analysis will be placed in coolers and maintained at 4°C until delivered to the laboratory.

Decontamination Procedures

The shelby tube or other sampling device used to procure the soil samples and the sample mixing equipment will be decontaminated prior to the collection of each sample. The decontamination procedure will include:

1) the removal of soil and debris from the shelby tube or split spoon sampler and other equipment,
2) washing of the equipment with detergent and water,
3) rinse with distilled water, followed by
4) rinse with a 50 percent methanol, 50 percent distilled water solution and
5) final rinse with distilled, deionized water.

A sample of the final rinse water will be collected during one of the decontamination events to document the effectiveness of the procedure. The wash water (Equipment Blank) will be analyzed for the same parameters which the soil samples will be tested for.

Field Sampling Records

The sampling team will keep complete records of their activities and observations during the sampling operations. These records will include at a minimum:

- a sample number, unique to each sample location and sample depth;
- ~~the time and date at which each sample was taken;~~
- the vertical depth each sample was taken from;
- any observations made about the sample or the sample location; and
- any unusual visual or olfactory observations made about the sample or the sample location, including the presence of free hydrocarbons;
- soil classification according to USCS; and
- the name(s) of the sampling personnel.

Sample Labeling

The sampling team will accurately and clearly label each sample taken during the sampling operations. These records will include at the minimum:

- a sample number, unique to each sample location and sample depth;
- the time and date at which each sample was taken;
- the vertical depth each sample was taken from;
- the name of the sampling personnel and project name;and
- parameters to be tested by the laboratory.

3.4 Groundwater Sampling Methods

Groundwater sampling will be conducted after the monitoring wells have been installed and developed. Procedures for well installation and development are provided in Appendix No. 2. As part of the groundwater monitoring, the groundwater gradients will be determined by measuring the static water level (potentiometric surface) in each well within a period of one hour. If floating hydrocarbons are detected in a well, the thickness of the hydrocarbon layer will be measured. The water level will be determined in each well and used to calculate the volume required to be purged from each well.

The static water level and total depth will be determined in each of the monitoring wells and one of the following conversion factor will be used to determine the volume of standing water in each well (depending on casing size):

| Casing Diameter | Gallons/Linear Foot |
|---|---|
| 2" | 0.16 |
| 4" | 0.65 |
| 6" | 1.47 |

Well Purging Procedures

Each well will be purged three to five well volumes prior to sampling. Each well volume will be calculated and then multiply by 3 or 5 to determine the volume of water to be removed. The volume of purged water will be measured by counting the number of bailers full of water which have been removed or the number of 5 gallon buckets filled while bailing. The purged water will be collected into 55 gallon drums and taken to an appropriate location for treatment. The groundwater monitoring wells will be ready to sample when successive bailed samples meet the following criteria: the temperature changes by less than 1° C, the pH falls within 0.2 su and the conductivity varies less than 10 percent. Otherwise the well will be bailed dry three times prior to sampling. The groundwater monitoring wells will be sampled with a teflon or stainless steel bailer. These samples will be placed in clean containers and labeled in accordance with the procedures presented in this section.

Sampling Procedure

The water level within the well should be determined prior to taking the samples which will be sent to the laboratory for analysis. A clean teflon or stainless steel bailer will be used to obtain the groundwater sample from each well. Previously cleaned teflon or stainless steel bailers will be brought to the site by the sampling team. The first bailer full of water will be discarded. The samples will be placed in laboratory prepared sample containers. Some of the sample containers may contain preservatives added at the laboratory. Samples obtained for metals analysis should be filtered prior to placing them in the prepared sample container. Filtration will be through 0.45 micron filter paper which should be replaced between each well. The forms provided in Appendix No. 4 will be completed for each well which is sampled.

Sampling Equipment Decontamination Procedures

The teflon or stainless steel sampling bailers will be cleaned under the following procedures following each sampling event:

1) Each Bailer will be washed and scrubbed with soap and water,
2) The bailer will be rinsed with distilled, deionized water,
3) Each Bailer will be rinsed with a 50 percent methanol, 50 percent distilled water solution,
4) Then each Bailer will be rinsed with distilled, deionized water.
5) The water level sensing and filtering devices will be rinsed with distilled, deionized water.

All purged well water and wash waters will be collected and disposed of at an appropriate location.

Field Sampling Records
The sampling team will keep complete records of their activities and observations during the sampling operations on the forms provided in Appendix No. 4. These records should include at the minimum :

- o a sample number unique to each groundwater monitoring well;
- o the initial depth to water in each groundwater monitoring well and the time of water level measurement;
- o the depth to water in each groundwater monitoring well when sampled for analysis and the time of water level measurement;
- o any unusual visual or olfactory observations made about the sample or the sample location, including the presence of floating hydrocarbons; and
- o the time and date at which each sample was taken;
- o the name(s) of the sampling personnel.

Sample Labeling
The sampling team should accurately and clearly label each sample taken during the sampling operations. These records should include at the minimum:

- o the time and date at which each sample was taken;
- o the groundwater monitoring well each sample was taken from;
- o parameters to be tested for, and
- o the name of the sampling personnel.

Sample Preservation
Samples will include soil and groundwater which may require that preservatives be added; in addition to added preservatives, all samples will be placed in coolers using ice to maintain an internal temperature of approximately 4° Celsius (°C). Preservatives will be added to each groundwater sample as necessary. Water samples in the form of Equipment and Field Blanks will be preserved in the same manner as the groundwater samples. The sample coolers will be checked daily until all samples are delivered to the laboratory to assure that the ice is adequately cooling the samples. The samples will be delivered to the laboratory with sufficient time to ensure that they can be analyzed within the holding times listed in Appendix 3. The original copy of the chain of custody will be sent to the laboratory along with the samples.

Chain of Custody Procedures
All sample containers will be sealed and labeled prior to placing them into coolers for transport to the laboratory. Appropriate information for each container will be logged onto a Chain of Custody (COC) form which will accompany the samples to the laboratory. The COC will include the name of the sample, type of sample (grab or composite) and the

analysis to be performed on that sample. The completed COC will be signed by the sampler and turned over to a delivery service or directly to the analytical laboratory after it has been signed.

A sample number unique to each sample and a sample description will be logged onto a chain of custody form. In addition the following information will be entered onto the chain of custody form:

- o Date & Time sample collected;
- o Sampler(s) Name and Signature;
- o Number of Sample Containers for each groundwater monitoring well or sample location;
- o Sample Relinquishing Signature(s) with Date(s) and Time(s); and
- o Temperature of Sample Shuttle upon receipt by laboratory.

## 4.0 HEALTH AND SAFETY MEASURES

The minimum safety equipment of the field team will consist of hard hats, steel toed boots, rubber gloves and safety glasses, which will be worn by all field personnel as necessary. Personnel who may be exposed to hazardous wastes or may be required to wear a respirator will have appropriate training as required under 29 CFR 1910. A detailed safety procedure plan for the Site Investigation will be prepared prior to initiating field activities.

## 5.0 SCHEDULE & INVESTIGATION REPORT CONTENTS

This Sampling and Analysis Plan proposes a program to gather sufficient information to evaluate sludge management alternatives and determine if there has been a release of waste constituents from the Guard Basin and Lime Pits. The results of the study will be used to develop an environmentally sound closure plan for these impoundment.

### 5.1 Project Schedule

The implementation of the field investigation, laboratory testing and preparation of the project report is estimated to require 13 weeks. This schedule assumes the identification of sampling locations will require one week, the collection of sludge samples will require two weeks, installation of monitoring wells and soil sampling will require two weeks, testing and chemical analysis of samples will require four weeks, review and interpretation of the laboratory data will require two weeks, and the preparation of the final report will require two weeks.

### 5.2 Investigation Report

The objective of the investigation report will be to determine:

1) The volume of sludge contained in the impoundments;

2) What are the chemical and physical characteristics and waste classifications for the sludges and affected soils;

3) Whether the soils around the Guard Basin and Lime Pits have been affected by a release;

4) To what depth and direction the soils have been affected;

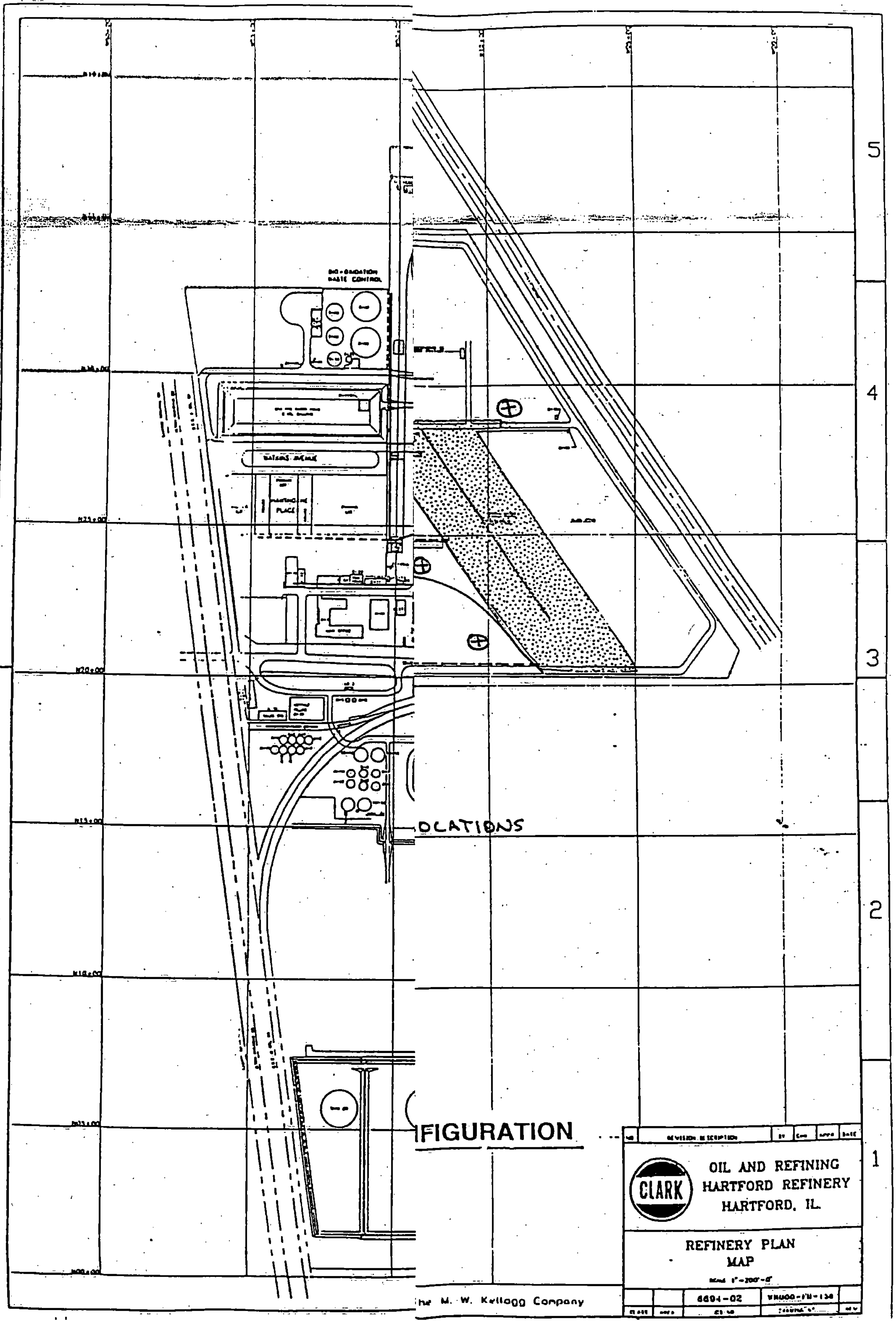
5) Whether the groundwater in the area of the impoundments has been affected;

6) The geologic and hydrologic conditions in the area of the impoundments;

The report will contain the results of chemical analysis of the sludges and an estimate of the volume contained within the impoundments. The analysis of soils and groundwater will be evaluated to determine whether waste constituents have been released from the impoundments.- The hydrogeology of the area around the Guard Basin and Lime Pits will also be characterized to assist in evaluation of on-site waste management alternatives.

# APPENDIX NO. 1

## FACILITY DRAWING AND SAMPLE LOCATIONS



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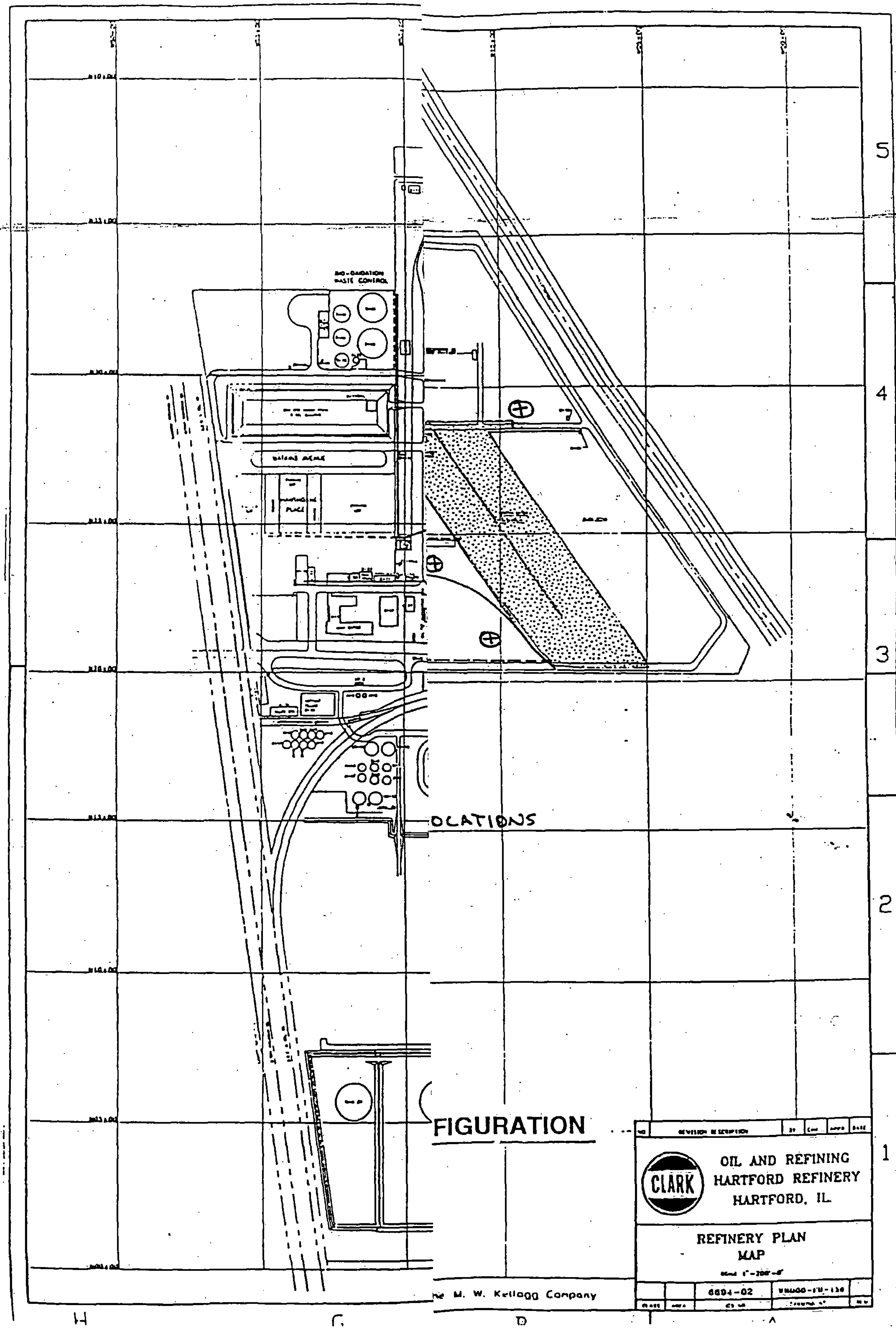
The M. W. Kellogg Company



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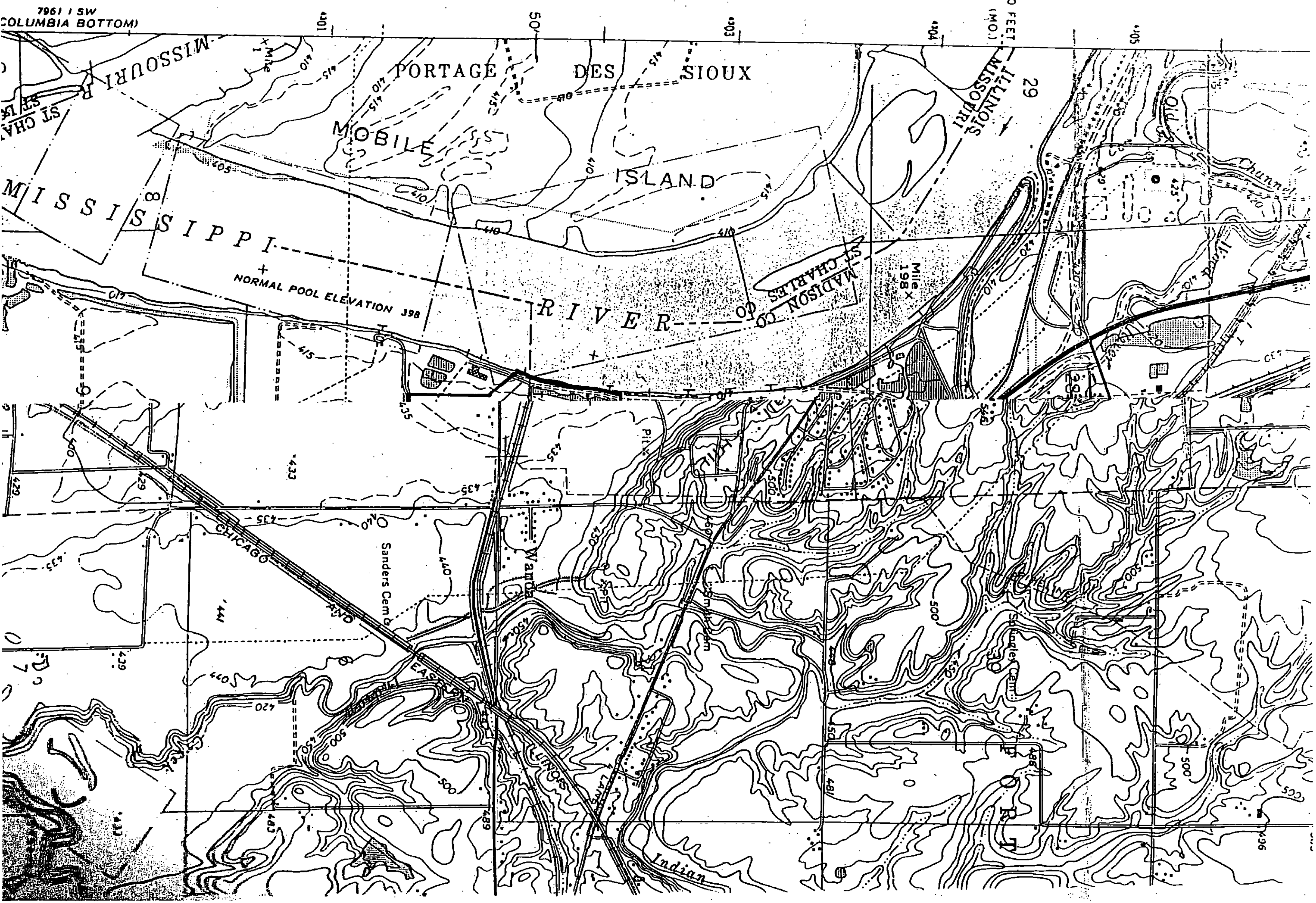
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Mile 198
Channel
Sanders Cem
CHICAGO AND EASTERN ILLINOIS
Wann
Indian

# APPENDIX NO. 2

# WELL INSTALLATION AND DEVELOPMENT PROCEDURES

## MONITORING WELL INSTALLATION PROCEDURES

1. Daily Procedures

    a. Obtain work permit from Unit Foreman

    b. Check safety gear and conduct tailgate safety meeting before beginning work

2. Soil Sampling Activities

    a. Setup drill rig over pre-selected boring location

    b. Advance shelby tube or split spoon sampler 2 feet into soil

    c. Remove tube and extract sample

    d. Check sample for volatile organics using OVA

    e. Record OVA readings on core log or in field notebook with depth

    f. If elevated readings are detected using the OVA, retain the sample for chemical analysis

    g. Sampling according to the plan, a minimum of 2 samples per boring will be analyzed for BETX, lead, chromium and TPH. The objective is to obtain samples which represent worst case (ie. the highest level of contaminants). In order to do this, portions of the core will have to be preserved until the actual samples to be analyzed have been selected. The cores should be wrapped in foil and placed in a cooler until the two samples selected for laboratory analysis are selected. In the event that a sludge layer or a grossly contaminated zone is encountered, samples should be collected in approved bottles and kept cool as if they were to be sent for laboratory analysis. A sufficient volume of sample will be obtained, placed in proper containers and properly preserved in all cases.

    h. Each boring location will be sampled continuously until the desired depth is reached. At each significant lithologic break, samples will be obtained for field classification. This sampling will not interfere with obtaining samples for chemical analysis. Necessary information for the cores includes:

    - USCS soil type
    - USCS color
    - texture
    - mineral composition
    - moisture content
    - grain size distribution

i. Prepare log of core using USCS colors and nomenclature

j. Drill until time to obtain next undisturbed soil sample

k. Repeat steps b through j

l. The cuttings generated during the drilling will be placed in drums for storage until they can be characterized for proper disposal. If core samples indicate high levels of contaminants at the current drilling depth, cuttings will be placed in specially marked drums

m. If no contamination is indicated by the OVA, cuttings will be placed in drums labeled uncontaminated materials

n. The borings are to be converted into 2 inch diameter PVC monitoring wells. The monitoring wells will be installed in the first water bearing zone. Well installation procedures are intended to allow collection of representative samples of groundwater in the area of the impoundments.

3. Well Installation and Development Activities

a. Using procedures described above, drill through the uppermost aquifer and approximately three (3) feet below it into the underlying clay or shale. If after reviewing existing borehole logs of the immediate area and evaluating samples taken while drilling the borehole, it is determined that extended screening above or below formation of interest will possibly be near another water bearing zone, i.e. a very thin but effective clay layer above or below the zone of interest, the well screen will be installed to screen only the exact thickness of the zone of interest. Note the thickness of the zone to be screened. Use a stem auger drill bit size that will result in an annulus of at least 2.5 and preferably 3 inches between the borehole wall and the well casing to allow installation of gravel/sand pack, bentonite pellets and grout.

b. Casing and screen materials will be selected with consideration to geochemistry, anticipated lifetime of the monitoring program, well depth, chemical parameters to be monitored and other site specific factors. PVC screen and casing with flush thread connections is proposed for this location. Appropriate well screen length will be chosen so that the screen extends approximately one foot above the zone to be screened if it is confined and one foot below the zone. If the zone to be screened is under water table conditions, the well screen will extend several feet above the water table to allow for seasonal fluctuations and one foot below the zone.

c. Screen length will be calculated and cut from the internally threaded female end. Over this end a special slip coupling fitted with a backwash valve will be placed, unless Clark Oil has requested a common slip cap. A 0.25 inch hole will be drilled through the cap or coupling and the screen inside it in two or more places. A precut

0.25 inch PVC peg will be driven into the holes to secure the cap or coupling in place. Appropriate lengths of the desired diameter casing will be attached to the custom fabricated well screen of the same diameter so that the top of the casing extends approximately 2 1/2 feet above the ground.

d. The filter pack will be installed around the screened interval and two (2) feet above it if the water bearing zone is under water table conditions or if it is overlain be a thick clay or shale. If the water bearing zone is confined and overlain by a very thin clay or shale (as noted in an exception earlier in this document) and only the exact thickness of the zone has been screened, then the filter pack will be placed level with the top of the screen. The filter pack will be chemically inert (e.g., clean quartz sand, silica, or glass beads), well rounded, and dimensional stable.

e. Seal the annular space using bentonite pellets or a bentonite slurry which will prevent the migration of contaminants to the sampling zone from the surface or intermediate zones and prevent cross contamination between strata. The materials will be chemically compatible with the anticipated waste to ensure seal integrity during the life of the monitoring well.

f. The well casing will be vented. The backwash valve will not be used again and when the protective casing is installed, access to the inner casing for venting will be difficult.

g. Above the initial annular seal material of bentonite, a cement and bentonite grout mixture will be used up to just below the surface. Any remaining annular space will be filled with concrete blending into a four-inch thick apron extending three (3) feet or more from the outer edge of the borehole. Since PVC casing will be used, steel casing will be installed around the "in hole" casing and cemented in place with this final cementing procedure. The protective casing will allow two (2) to five (5) inches of working space between the inner and outer protective casings. The protective casing will have as minimum specifications: 1) Hinge, 2) Hasp for lock, 3) Riser pipe within 6 inches of the top of the protective casing, 5) Will be painted if steel, and 6) Have the well# and the elevation permanently marked on the casing.

h. Upon completion of the well, installation of a suitable threaded cap or compression seal will be placed or locked in properly to prevent either tampering with the well or the entrance of foreign material into it. It is important that the protective well casing is also vented to the outside atmosphere to provide an avenue for the escape of gas, if this should be a problem now or in the future. Placement of concrete or steel bumper guards around the well will prevent possible damage to the well casing.

i. The proper forms will be filled out showing a diagram of the well and materials used in installation and a sketch map of the well location relative to some fixed landmark. Finally the well will be surveyed to show its elevation and exact location. The elevation and well number will be permanently placed on the well.

j. Decontaminate drill augers and sampling devices using steam cleaner. Additional decontamination procedures for sampling devices used to obtain soils for chemical analysis include:

- detergent wash
- water rinse (tap water)
- 50 percent methanol distilled water mixture spray rinse
- de-ionized water rinse

k. Set up at new drilling location - See step a of soil boring procedures.

l. Well development will be accomplished by bailing water from the completed well until clear water is obtained. This will normally require that at least ten well volumes are evacuated from the casing. The water evacuated from the well will be collected for disposal.

# APPENDIX NO. 3

## SAMPLE CONTAINER
## AND
## SAMPLE PRESERVATION
## AND
## SKINNER LIST CONSTITUENTS

# SAMPLE PRESERVATION SUMMARY

## RCRA

### ORGANICS[9]

| | CONTAINER[1] | PRESERVATION | HOLDING TIME[2] | SAMPLE VOLUME[3] |
|---|---|---|---|---|
| *Volatile Organics* (Methods 8010, 8020, 8240) | | | | |
| **Concentrated waste samples for volatiles** | Wide-mouth jars, G Teflon lined cap | None | 14 days | 8 oz. |
| **Liquid samples for volatiles** | | | | |
| No Residual Chlorine | G, Teflon lined septum | Cool, 4°C, 4 drops [HCl] | 14 days | 2 x 40 ml |
| Residual Chlorine | G, Teflon lined septum | Collect in 4 oz. VOA container, preserved with 10% $Na_2S_2O_3$[4], mix & transfer to 40 ml vial/4 drops [HCl], Cool, 4°C | 14 days | 2 x 40 ml |
| Acrolein and Acrylonitrile (Method 8030) | G, Teflon lined septum | Cool, 4°C, Adjust pH to 4-5[6] | 14 days | 2 x 40 ml |
| **Soil/Sediment & Sludge samples for volatiles** | Wide-mouth jars, G Teflon lined cap | Cool, 4°C | 14 days | 4 oz. |
| *Semi-volatile Organics* (Methods 8040, 8060, 8080, 8090, 8100, 8120, 8140, 8150, 8240, 8250, 8270, 8280) | | | | |
| **Concentrated waste samples for semi-volatiles** | Wide-mouth jars, G Teflon lined cap | None | 14 days to extraction, 40 days after extraction | 8 oz. |
| **Liquid samples for semi-volatiles** | | | | |
| No Residual Chlorine | G, Amber, Teflon lined cap, 1 gal. or two ½ gal. | Cool, 4°C | 7 days to extraction, 40 days after extraction | 1 gallon |
| Residual Chlorine | G, Amber, Teflon lined cap, 1 gal. or two ½ gal. | Add 3 ml 10% $Na_2S_2O_3$[4] per gal., Cool, 4°C | 7 days to extraction, 40 days after extraction | 1 gallon |
| **Soil/Sediment & Sludge samples for semi-volatiles** | Wide-mouth jars, G Teflon lined cap | Cool, 4°C | 14 days to extraction, 40 days after extraction | 8 oz. |

### INORGANICS[9]

| | | | | |
|---|---|---|---|---|
| Metals (except Chromium VI and Mercury) | P/G | pH $<2$,/$HNO_3$ | 6 months | 600 ml |
| Chromium VI | P/G | Cool, 4°C | 24 hours | 400 ml |
| Mercury | P/G | pH $<2$,/$HNO_3$ | 28 days | 400 ml |

## NOTES

1. Polyethylene (P) / Glass (G).
2. Holding Time given is the MAXIMUM time that a sample may be held prior to analysis and still be considered as valid.
3. Does NOT include additional volumes necessary for laboratory Quality Control (QC) analyses.
4. Use ONLY in the presence of residual chlorine.
5. When sulfide is present, the maximum holding time is 24 hours.
6. If ACROLEIN is not being measured, then the pH adjustment is not required. If acrolein is being measured, but the pH is not adjusted, then the analysis must be performed within three days of sampling.
7. Holding Time is based upon the date of RECEIPT at the laboratory.
8. US EPA, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, 40 CFR 136, October 26, 1984.
9. US EPA, *Test Methods for Evaluating Solid Waste*, SW-846, 3rd Edition, November, 1986.

# GROUNDWATER MONITORING

## DRINKING WATER SUITABILITY

| | | | | |
|---|---|---|---|---|
| Arsenic | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Barium | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Cadmium | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Chromium | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Lead | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Mercury | P/G | pH <2,/$HNO_3$ | 28 days | 200 ml |
| Selenium | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Silver | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Coliform, Total | P/G sterile | Cool, 4°C, 0.008% $Na_2S_2O_3$[4] | 6 hours | 200 ml |
| Pesticides: | | | | |
| Endrin | G, Teflon lined septum | Cool, 4°C | 7 days to extraction, 40 days after extraction | 2000 ml |
| Lindane | G, Teflon lined septum | Cool, 4°C | 7 days to extraction, 40 days after extraction | 2000 ml |
| Methoxychlor | G, Teflon lined septum | Cool, 4°C | 7 days to extraction, 40 days after extraction | 2000 ml |
| Toxaphene | G, Teflon lined septum | Cool, 4°C | 7 days to extraction, 40 days after extraction | 2000 ml |
| Herbicides: | | | | |
| 2,4-D | G, Teflon lined septum | Cool, 4°C | 7 days to extraction, 40 days after extraction | 2000 ml |
| 2,4,5-TP (Silvex) | G, Teflon lined septum | Cool, 4°C | 7 days to extraction, 40 days after extraction | 2000 ml |
| Fluoride | P | pH <2,/$HNO_3$ | 28 days | 300 ml |
| Nitrate (as N) | P/G | Cool, 4°C, pH <2,/$H_2SO_4$ | 28 days | 1000 ml |
| Gross Alpha | P/G | pH <2,/$HNO_3$ | 6 months | 1 gallon |
| Gross Beta | P/G | pH <2,/$HNO_3$ | 6 months | 1 gallon |
| Radium 226 | P/G | pH <2,/$HNO_3$ | 6 months | 1 gallon |
| Radium 228 | P/G | pH <2,/$HNO_3$ | 6 months | 1 gallon |

## GROUNDWATER QUALITY

| | | | | |
|---|---|---|---|---|
| Iron | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Manganese | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Sodium | P/G | pH <2,/$HNO_3$ | 6 months | 200 ml |
| Chloride | P/G | Cool, 4°C | 28 days | 50 ml |
| Phenols | G | Cool, 4°C, pH <2,/$H_2SO_4$ | 28 days | 500 ml |
| Sulfate | P/G | Cool, 4°C | 28 days | 50 ml |

## CONTAMINATION INDICATOR PARAMETERS

| | | | | |
|---|---|---|---|---|
| Specific Conductance | P/G | Cool, 4°C | 28 days | 100 ml |
| pH | P/G | Cool, 4°C | Analyze immediately | 25 ml |
| Total Organic Carbon (TOC) | G, Amber Teflon lined cap | Cool, 4°C, pH <2,/HCl | 28 days | 4 x 25 ml |
| Total Organic Halogen (TOX) | G, Amber Teflon lined cap | Cool, 4°C, add 1 ml 1.1 M sodium sulfite[4] | 28 days | 4 x 100 ml |

## UNDERGROUND STORAGE TANKS

| | | | | |
|---|---|---|---|---|
| Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) | G, Teflon lined septum | Cool, 4°C, 0.008% $Na_2S_2O_3$[4], pH <2,/HCl | 14 days | 2 x 40 ml |
| Hydrocarbon Characterization | G, Teflon lined cap | Cool, 4°C | 7 days to extraction, 40 days after extraction | 2000 ml |

## NOTES

1. Polyethylene (P) / Glass (G).
2. Holding Time given is the MAXIMUM time that a sample may be held prior to analysis and still be considered as valid.
3. Does NOT include additional volumes necessary for laboratory Quality Control (QC) analyses.
4. Use ONLY in the presence of residual chlorine.
5. When sulfide is present, the maximum holding time is 24 hours.
6. If ACROLEIN is not being measured, then the pH adjustment is not required. If acrolein is being measured, but the pH is not adjusted, then the analysis must be performed within three days of sampling.
7. Holding Time is based upon the date of RECEIPT at the laboratory.
8. US EPA, *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*, 40 CFR 136, October 26, 1984.
9. US EPA, *Test Methods for Evaluating Solid Waste*, SW-846, 3rd Edition, November, 1986.

Skinner Analysis;[1]

Metals:
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Lead
Mercury
Nickel
Selenium
Vanadium

Volatiles:

Benzene
Carbon Disulfide
Chlorobenzene
Chloroform
1,2-Dichloroethane
1,4-Dioxane
Ethyl benzene
Ethylene Dibromide
Methyl ethyl ketone
Styrene
Toluene
Xylene

Semivolatile Base/Neutral Extractable Compounds:

Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene
Bis(2-ethylhexyl) phthalate
Chrysene
Dibenz(a,h)acridine
Dibenz(a,h)anthracene
Dichlorobenzenes
Diethyl phthalate
7,12-Dimethylbenz(a)anthracene
Dimethyl phthalate
Di(n)butyl phthalate
Di(n)octyl phthalate
Fluoranthene
Indene
Methyl chrysene
1-Methyl naphthalene
Naphthalene
Phenanthrene
Pyrene
Pyridine
Quinoline

Semivolatile Acid-Extractable Compounds:

Benzenethiol
Cresols
2,4-Dimethylphenol
2,4-Dinitrophenol
4-Nitrophenol
Phenol

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1 Skinner List based on EPA/530-SW-85-003, April 1985 Report; Petitions to Delist Hazardous Wastes A Guidance Manual, page 19.

# APPENDIX NO. 4

# FIELD SAMPLING LOG FORMS

WELL OR DATE ____________

# WATER LEVEL DATA

WELL LOCATION ____________ MEASURING POINT ____________

ELEVATION: MEASURING POINT ____________ GROUND LEVEL ____________

LOCATION ____________

PROJECT ____________

| WELL or DATE | TIME | MEASURING DEVICE | READING | CONVERSIONS or CORRECTIONS | WATER LEVEL | | BY | COMMENTS |
|---|---|---|---|---|---|---|---|---|
| | | | | | DEPTH | ELEVATION | | |
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BROWN AND CALDWELL

P.O. BOX 8045 WALNUT CREEK, CA 94596-1220 • (415) 937-9010 TELEX 33-6490 • OFFICE AT 3480 BUSKIRK AVENUE PLEASANT HILL 94523

Figure 87-7, Water level data form

# FIELD WATER QUALITY SAMPLING AND ANALYSES

INSTRUMENTS:

TEMPERATURE ____________________

CONDUCTIVITY ____________________

pH ____________________

OTHER:

____________________

____________________

____________________

LOCATION ________

PROJECT ________

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| GENERAL | LOCATION | | | | | | |
| | WATER SOURCE | | | | | | |
| | DATE | | | | | | |
| | CLOCK TIME or PUMPING TIME | | | | | | |
| SAMPLING CONDITIONS | SAMPLING METHOD | | | | | | |
| | DEPTH SAMPLE TAKEN | | | | | | |
| | WELL DEPTH | | | | | | |
| | WATER HEIGHT ON GAUGE or STAFF | | | | | | |
| | DISCHARGE (cfs or gpm) | | | | | | |
| | | | | | | | |
| | | | | | | | |
| FIELD MEASUREMENTS AND ANALYSES | TEMPERATURE (°C or °F) | | | | | | |
| | ELEC. COND. (μmhos/cm) | MEASURED | | | | | |
| | | AT 25°C | | | | | |
| | pH | | | | | | |
| | Eh | | | | | | |
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| | | | | | | | |
| SAMPLES COLLECTED and TREATMENT | GROSS | unfiltered unpreserved | | | | | |
| | TRACE METALS | filtered $HNO_3$ | | | | | |
| | RADIOLOGICS | unfiltered HCl | | | | | |
| | NUTRIENTS | filtered $HgCl$ | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | LABORATORY SENT TO / DATE | | | | | | |
| SAMPLED/ANALYZED BY | | | | | | | |

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Figure 73-7, Sampling form

LEVELING FIELD FORM FOR GROUNDWATER ELEVATION CONTROL

LOCATION: ______________________ PROJECT NUMBER: ______________

DATE: __________ INSTRUMENT: ______________ INSTRUMENT NUMBER: ______________

PARTY: ______________________(instrument) ______________________(rod)

PURPOSE: ______________________________________________

REFERENCE POINT DESCRIPTION: ______________________________

REFERENCE POINT ASSSUMED ELEVATION: __________ SOURCE: ______________

| STA. | BS(+) | HI | FS(-) | ELEV. | REMARKS |
|---|---|---|---|---|---|
| REF. | | | | | Reference Point for Establishing Datum |
| | | | | | |
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CHECK: __________ __________ REVIEWER: ______________

DEFINITIONS: STA. - Rod Station. Point of established elevation or point being established. Typically designated by a number (ie. 1, 2, 3, etc.)
BS - Backshot. A level shot to a point of known or just established elevation for the purpose of establishing a new instrument HI. (ELEV. + BS = HI)
HI - Height of Instrument. The elevation of the instrument crosshair, as established by a backshot to a point of known elevation.
FS - Foreshot. A level shot to a point of unknown elevation, made to establish the elevation of that point. (HI - FS = ELEV.)
ELEV. - Elevation. The elevation of a station. May be tied to mean sea level datum or can be an arbitrary elevation datum established to determine the relative elevation difference between various stations.
(TP) - Turning Point. Rod station about which the instrument is turned or moved. A level station for which an elevation is established by a FS. Then the instrument is moved to a new location and a BS is made to the TP to establish a new HI. The "(TP)" notation goes in the STA. column next to the number of the station about which the instrument is moved (ie. (TP)2, (TP)5, etc.)

COMMENTS: ______________________________________________

Figure 35-1, Level circuit form

## RECEIPT FOR SAMPLES

| PROJECT NO. | PROJECT NAME | Name of Facility |
|---|---|---|
| SAMPLER(S): *(Signature)* | | Facility Location |
| Split Samples Offered ( ) Accepted ( ) Declined | | |

| Station Number | Date | Time | Comp. | Grab | Split Samples | Tag Numbers | Station Description | No. of Containers | Remarks |
|---|---|---|---|---|---|---|---|---|---|
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| Transferred by: *(Signature)* | | Received by: *(Signature)* | | Telephone Number |
|---|---|---|---|---|
| Date | Time | Title | Date | Time |

Distribution: Original to Coordinator Field Files; Copy to Facility

Figure 90-7, Receipt-for Samples form

CHAIN OF CUSTODY RECORD

BC Log Number ______

| | |
|---|---|
| Client name | Project or PO# |
| Address | Phone # |
| City, State, Zip | Report attention |

| Lab Sample number | Date sampled | Time sampled | Type* See key below | Sampled by / Sample description | Number of containers | Analyses required | | | | | | | Hazardous sample Special handling required | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Signature | Print Name | Company | Date | Time |
|---|---|---|---|---|
| Relinquished by | | | | |
| Received by | | | | |
| Relinquished by | | | | |
| Received by | | | | |
| Relinquished by | | | | |
| Received by Laboratory | | | | |

**BROWN AND CALDWELL LABORATORIES**

☐ 1255 Powell Street, Emeryville, CA 94608 (415) 428-2300

☐ 373 South Fair Oaks Avenue, Pasadena, CA 91105 (818) 795-7553

☐ 1200 Pacifico Avenue, Anaheim, CA 92805

Note:
Samples are discarded 30 days after results are reported unless other arrangements are made.
Hazardous samples will be returned to client or disposed of at client expense.

*KEY: AQ—Aqueous NA—Nonaqueous SL—Sludge GW—Groundwater SO—Soil OT—Other PE—Petroleum

Figure 90-6, Chain-of-Custody form

# APPENDIX NO. 2

# FIELD INVESTIGATION SUMMARY

Source: IEPA BOL

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

Date: June 2, 1994

To: Carol Barry

From: John Sherrill #785-5697 J. Sherrill

Re: 1190500002--Madison County
Hartford/Clark Oil Refinery
Superfund/Technical Reports

The Agency agrees with the proposed Work and Quality Assurance Plans for the above referenced site (latest revisions in a May 24, 1994 letter from Clark Oil's environmental consultant, Black & Veatch Waste Science, Inc.). The purpose of the plans is to verify that sludge has been removed from the Guard Basin and to monitor any potential groundwater impacts.

In summary, surface and subsurface soil samples will be taken from the east and west sides of the Guard Basin, which will characterize any remaining contamination. Also, groundwater samples will be collected semi-annually for two years.

This work is expected to commence in the near future and will occur with Agency personnel taking some confirmation samples. If you have any questions please contact me.

JSS:jss

cc: Collinsville Region
Division File
Jim Morgan, IAG

SCREENED

Source: IEPA BOL

# M E M O R A N D U M

DATE: January 4, 1994

TO: Division Files

FROM: Chris Cahnovsky - Collinsville Region CNC

SUBJECT: 11905000002 - Madison County
Clark Oil and Refining
ILD041889023
FOS

On January 3, 1994 I conducted a site visit at the Clark Oil and Refining facility in Hartford, Illinois. The purpose of this visit was to observed the apparent completion of F037 and F038 sludge removal from the western portion of the Guard Basin and to observe the status of sludge removal of the eastern portion of the Guard Basin. I arrived on site at 2:09 p.m. and met with Bill Irwin and Massood Modarres.

Mr. Irwin said that the sludge removal in the western portion was completed on December 10, 1993. Approximately 4.5 to 5 feet of sludge was removed from the bottom of the western portion of the basin and sent to Peoria Disposal Company as F037 and F038. I conducted a visual inspection of the Guard Basin. The sludge appears to have been adequately removed from the western portion of the Basin. The bottom of the surface impoundment appeared to be a mixture of clay and soil. Some oil stained dirt was observed. Mr. Irwin said that this stained soil was not sludge. On the southeastern end of the cleared part of the Basin standing water was observed. This water did not appear to have a petroleum sheen on top. Per Mr. Irwin, Clark has had no problem with groundwater entering the western portion of the Guard Basin.

The consulting firm of Black and Veach have conducted an assessment of this area to determine and certify that all of the sludge has been removed. According to Mr. Irwin, 35,000 cubic yards of sludge have been removed from the Guard Basin to date. There are about 10,000 cubic yards remaining in the eastern portion of the Guard Basin. Clark originally estimated that the Guard Basin contained 24,420 cubic yards of sludge. The eastern portion is expected to be completed by the end of January, 1994. At which time another inspection will be conducted.

A dam has been constructed between the eastern and western portions of the Guard Basin and Clark intends to release storm water back into the western portion of the Basin the week of January 10, 1994. I asked Mr. Irwin if releasing stormwater into this portion would compromise the results of any bottom samples the Agency may require. He did not feel that any future sampling would be affected by the stormwater. I also inquired about oil that might be contaminating the stormwater. Mr. Irwin said that oil is skimmed off the stormwater in the "cement pond" before being discharged to the Guard Basin. If any further work needs to be done, Clark could drain the stormwater from the Basin. I concluded this site visit at 3:04 p.m.

The following is a list of attachments to this memo:

1) Guard Basin Clean Up Truck Loading Schedule - Update;
2) Guard Basin Clean Up - Cost Update and Projection;
3) TCLP Volatile Organic Analysis for Guard Basin Sludge w/ trip blank;
4) TCLP Metals Analysis for Guard Basin Sludge;
5) Site Map and
6) Site photographs.

CNC
cc: Collinsville Region
cc: Carol Berry - DLC
cc: John Sherrill

# INTEROFFICE CLARK MEMORANDUM

**Hartford Refinery**

TO: G. R. Watson
R. E. Schuetz
B. Irwin

FROM: D. A. Schwartzkopf

DATE: December 4, 1993

SUBJECT: Guard Basin Clean Up Truck Loading Schedule - Update

---

The following data is furnished as a schedule update for truck loading on the guard basin project:

| Date | No. Of Trucks To Load | Actual | Cumulative Scheduled | Cumulative Actual |
|---|---|---|---|---|
| 8-30-93 | 0 | 5* | 5 | 5 |
| 8-31-93 | 20 | 15 | 25 | 20 |
| 9-01-93 | 20 | 16 | 45 | 36 |
| 9-02-93 | 30 | 29 | 75 | 65 |
| 9-03-93 | 30 | 0 | 105 | 65 |
| 9-06-93 | 0 | 0 | 105 | 65 |
| 9-07-93 | 35 | 0 | 140 | 65 |
| 9-08-93 | 40 | 10 | 180 | 75 |
| 9-09-93 | 40 | 0 | 220 | 75 |
| 9-10-93 | 45 | 0 | 265 | 75 |
| 9-13-93 | 45 | 0 | 310 | 75 |
| 9-14-93 | 45 | 11 | 355 | 86 |
| 9-15-93 | 45 | 20 | 400 | 106 |
| 9-16-93 | 50 | 20 | 450 | 126 |
| 9-17-93 | 50 | 19 | 500 | 145 |
| 9-20-93 | 50 | 19 | 550 | 164 |
| 9-21-93 | 50 | 25 | 600 | 189 |
| 9-22-93 | 50 | 9 | 650 | 198 |
| 9-23-93 | 50 | 0 | 700 | 198 |
| 9-24-93 | 50 | 0 | 750 | 198 |
| 9-27-93 | 50 | 0 | 800 | 198 |
| 9-28-93 | 50 | 13 | 850 | 211 |
| 9-29-93 | 50 | 15 | 900 | 226 |
| 9-30-93 | 50 | 17 | 950 | 243 |
| 10-01-93 | 50 | 19 | 1000 | 262 |
| 10-04-93 | | 20 | | 282 |

| | | |
|---|---|---|
| 10-05-93 | 20 | 302 |
| 10-06-93 | 24 | 326 |
| 10-07-93 | 32 | 358 |
| 10-08-93 | 25 | 383 |
| 10-11-93 | 21 | 404 |
| 10-12-93 | 24 | 428 |
| 10-13-93 | 24 | 453 |
| 10-14-93 | 10 | 463 |
| 10-15-93 | 24 | 487 |
| 10-18-93 | 23 | 510 |
| 10-19-93 | 22 | 532 |
| 10-20-93 | 23 | 555 |
| 10-21-93 | 20 | 575 |
| 10-22-93 | 21 | 596 |
| 10-25-93 | 22 | 618 |
| 10-26-93 | 27 | 645 |
| 10-27-93 | 27 | 672 |
| 10-28-93 | 28 | 700 |
| 10-29-93 | 33 | 733 |
| 11-01-93 | 22 | 755 |
| 11-02-93 | 28 | 783 |
| 11-03-93 | 27 | 810 |
| 11-04-93 | 29 | 839 |
| 11-05-93 | 25 | 864 |
| 11-08-93 | 31 | 895 |
| 11-09-93 | 32 | 927 |
| 11-10-93 | 32 | 959 |
| 11-11-93 | 29 | 988 |
| 11-12-93 | 30 | 1018 |
| 11-15-93 | 24 | 1042 |
| 11-16-93 | 0 | 1042 |
| 11-17-93 | 24 | 1066 |
| 11-18-93 | 24 | 1090 |
| 11-19-93 | 21 | 1111 |
| 11-22-93 | 27 | 1138 |
| 11-23-93 | 26 | 1164 |
| 11-24-93 | 0 | 1164 |
| 11-25-93 | 0 | 1164 |
| 11-26-93 | 0 | 1164 |
| 11-29-93 | 24 | 1188 |
| 11-30-93 | 28 | 1216 |
| 12-01-93 | 26 | 1242 |
| 12-02-93 | 25 | 1267 |
| 12-03-93 | 0 | 1267 |
| 12-06-93 | 0 | 1267 |
| 12-07-93 | 0 | 1267 |
| 12-08-93 | 0 | 1267 |
| 12-09-93 | 0 | 1267 |

| | | |
|---|---|---|
| 12-10-93 | 0 | 1267 |
| 12-13-93 | 25 | 1292 |
| 12-14-93 | 27 | 1319 |
| 12-15-93 | 25 | 1344 |

INTEROFFICE MEMORANDUM
**HARTFORD REFINERY**

TO: Bill Irwin

FROM: Ed Schuetz

DATE: December 4, 1993

SUBJECT: Guard Basin Clean-Up AFE 8927
Cost Update and Projection

REFERENCE: Attachment 1
Attachment 2
Attachment 3

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Regarding above said subject, please review referenced Attachment 1, cost summary. This summary reflects actual cost to date.

Refer to Attachment 2 for projected costs for labor, material and equipment per week. Refer to Attachment 3 for a tabulated summary of costs to date and a projected cost for completion.

Currently the total cost per cubic yard for disposal is $140.37. If this number does not change, based on the Construction Department's estimate of 23923 cu. yds of sludge remaining in basin, estimated remaining cost to complete as of 12/03/93 would be $3,358,071.51. This number does not include estimated expended total to date of $3,971,344.65. The projected Grand Total for completion is **$7,329,416.16**.

ES:sld

cc: DAS
GRW

# COST SUMMARY
# ESTIMATED COSTS TO DATE

## EQUIPMENT

| | | |
|---|---|---|
| • 790 EL LONG SKK TRAC-HOE: | | |
| 4 Months @ $9,000.00/month | | $36,000.00 |
| • CASE 1550 LP DOZER: (SWAMP CAT): | | |
| 3 Month @ $5,595.00/month | | $ 16,785.00 |
| 3 weeks @ $1,398.75/week | | $ 4,196.25 |
| | Total Swamp Cat | $ 20,981.25 |
| • JD 690 D TRAC-HOE: | | |
| 2 Weeks @ $2,000.0/week | | $ 4,000.00 |
| Modify Bucket | | $ 500.00 |
| | Total JD 690 | $ 4,500.00 |
| • CASE 220 TRAC-HOE: | | |
| 3 month @ $7,500.00/month | | $ 22,500.00 |
| 3 weeks @ $1,875.00/week | | $ 5,625.00 |
| Install 3 yd. bucket | | $ 1,000.00 |
| Install Cab A/C | | $ 3,600.00 |
| | Total Case 220 | $ 32,725.00 |
| • LINK BELT 60' TRAC-HOE: | | |
| 3 month @ $9,750.00/month | | $ 29,250.00 |
| 1 weeks @ $2,437.50/week | | $ 2,437.50 |
| Mob-Demob (Peoria) | | $ 2,000.00 |
| | Total Link Belt | $ 33,687.50 |
| • CRANE MATS: TRAC-HOE BASE SUPPORT | | |
| 3 Mats @ 14 weeks | | $ 2,100.00 |
| 6 Mats @ 17 weeks | | $ 5,100.00 |
| 4 Mats @ 15 weeks | | $ 3,000.00 |
| * NOTE: Mat Rental 50.00/Mat/Week | | |
| | Total Mat Rental | $10,200.00 |
| • PUMPS: DE-WATERING | | |
| 1-6" Detroit Diesel | | |
| 15 weeks @ $465.00/week | | $ 6,975.00 |
| 1-8" Sykes Diesel | | |
| 11 weeks @ $500.00/week | | $ 5,500.00 |
| 1-6" Allied Diesel | | |
| 17 weeks @ 450.00/week | | $ 7,650.00 |

extra

extra

extra

extra

| | | |
|---|---|---|
| 1-3" Gasoline Trash<br>17 weeks @ 152.00/week | | $ 2,584.00 |
| 1-JD Tractor Drive Gator Pump<br>168 hrs. @ 35.00/hr. | | $ 5,880.00 add |
| * NOTE: Rates include hose | | |
| | Total Pump Rental | $28,589.00 |

- PICK-UP TRUCK
  16 weeks @ $ 192.00 — $ 3,072.00 credit
- FUEL WAGON
  1 week at $ 70.00/week — $ 70.00
- SCALE PAD
  10'-0" x 10'-0" — $ 3,000.00
- CODE "L" WAGON PIPE SLEEVE
  Trench Labor Only (G.R.P.) — $ 500.00
- CODE "L" HOSE Y-FITTING (B.C.I.) — $ 1,200.00 extra
- ACCESS WALKWAY (B.C.I.) — $ 900.00 "
- SURFACE DRAINAGE PLUGS
  10 Locations — $ 1,000.00
- DIESEL PUMP PLATFORM W/STAIRS — $ 1,500.00
- ROCK
  2" clean, 3" minus & grade 8
  750 ton @ $5.50/T (Ave) — $ 4,125.00 extra
- BACKFILL
  45 loads @ $50.00/LD — $ 2,250.00 extra
- MISC. SUPPLIES & EQUIPMENT — $ 3,000.00

**TOTAL EQUIPMENT $187,299.75**

**CONTRACT LABOR**

| | | |
|---|---|---|
| B.C.I. CONTRACTORS, | | |
| Operator Journeyman | | |
| 1037 M.H. Straight Time | @ 43.18 | $ 44,777.66 |
| 347 M.H. Straight Time & 1/2 | @ 62.17 | $ 21,572.99 |
| Safety Director | | |
| 56 M.H. Straight Time | @ 42.64 | $ 2,387.84 |
| Laborer | | |
| 213 M.H. Straight Time | @ 36.61 | $ 7,797.93 |
| Mechanic | | |
| 33 M.H. Straight Time | @ 42.15 | $ 1,390.95 |
| Teamster | | |
| 28.5 M.H. Straight Time | @ 36.40 | $ 1,037.40 |
| | **TOTAL CONTRACT LABOR** | **$ 78,964.77** |

**CLARK LABOR**

| | | |
|---|---|---|
| Operators | | |
| 816 M.H. Straight Time | @ 25.00 | $20,400.00 |
| 339 M.H. Straight Time & 1/2 | @ 37.50 | $12,712.50 |
| Laborers | | |
| 1441 M.H. Straight Time | @ 25.00 | $36,025.00 |
| 568 M.H. Straight Time & 1/2 | @ 37.50 | $21,300.00 |
| | **TOTAL CLARK LABOR** | **$90,437.50** |

**P.D.C. SITE LABOR**

| | | |
|---|---|---|
| Project Manager | | |
| 340 M.H. Straight Time | @ 50.00 | $17,000.00 |
| 34 M.H. Per Diem | @ 75.00 | $ 2,550.00 |
| | **TOTAL P.D.C. SITE LABOR** | **$19,550.00** |

**P.D.C. EQUIPMENT**

| | | |
|---|---|---|
| Site Vehicle | | |
| 340 Hours | @ 7.50 | $ 2,550.00 |
| Trailer | | |
| 1 Month | @500.00 | $ 500.00 |
| | **TOTAL P.D.C. EQUIPMENT** | **$ 3,050.00** |

**P.D.C. LIME USAGE**

| | | |
|---|---|---|
| 994.49 Tons | @ 19.00/T | $18,895.31 |
| | **TOTAL P.D.C. LIME** | **$18,895.31** |
| **P.D.C. LUMP SUM** | | **$87,290.00** |

**P.D.C. SITE DISPOSAL**

| | | |
|---|---|---|
| 28292 CU. YDS. | @ ~~123.21~~ | |
| | **TOTAL P.D.C. SITE DISPOSAL** | **$3,485,857.32** |
| | | 3,387,401. |

119.75

COST SUMMARY

| | |
|---|---|
| Total Equipment | $ 187,299.75 |
| Total Clark Labor | $ 90,437.50 |
| Total Contract Labor | $ 78,964.77 |
| | |
| Total P.D.C. Labor | $ 19,550.00 |
| Total P.D.C. Equipment | $ 3,050.00 |
| Total P.D.C. Lime | $ 18,895.31 |
| Total P.D.C. Lump Sum | $ 87,290.00 |
| Total P.D.C. Site Disposal | $3,485,857.32 |
| **Grand Total** | **$3,971,344.65** |

PROJECTED T/M WEEKLY COSTS
LABOR,MATERIAL & EQUIPMENT



- **EQUIPMENT**

| | |
|---|---|
| 790 EL LONG STICK TRAC-HOE | $300.00/DAY |
| 1550 CASE DOZER | $186.50/DAY |
| 220 CASE TRAC-HOE | $250.00/DAY |
| LINK BELT 60' TRAC-HOE | $325.00/DAY |
| CRANE MATS (13 TOTAL) | $260.00/DAY |
| PUMPS,DIESEL | |
| TWO 6" & ONE 8" | $187.29/DAY |
| PUMP,GASOLINE | |
| ONE 3" | $21.71/DAY |
| PICK-UP TRUCK | $27.43/DAY |

SUB-TOTAL EQUIPMENT $1557.93

- CONSTRUCTION MATERIAL,SUPPLIES, CONSUMABLES AND SMALL EQUIPMENT. PLUS 20% PER DAY. $ 311.59

TOTAL EQUIPMENT/DAY $1869.52
**TOTAL EQUIPMENT/WEEK $11217.12**

- **LABOR,CONTRACTOR**

| | |
|---|---|
| OPERATOR FOREMAN, | |
| 48 M.H./WEEK STRAIGHT TIME $45.01/HR. | $2160.48 |
| 18 M.H/WEEK STRAIGHT TIME AND 1/2 $64.80/HR. | $1166.40 |
| OPERATOR JOURNEYMAN, | |
| 96 M.H./WEEK STRAIGHT $43.18/HR. | $4145.28 |
| 36 M.H./WEEK STRAIGHT TIME AND 1/2 $62.17/HR. | $2238.12 |
| SAFETY DIRECTOR, | |
| 4 M.H./WEEK STRAIGHT TIME $42.64 | $ 170.56 |
| LABORER | |
| 14 M.H./WEEK STRAIGHT TIME $36.61 | $ 515.54 |
| MECHANIC, | |
| 7 M.H./WEEK STRAIGHT TIME $42.15 | $ 295.05 |

| | |
|---|---|
| TEAMSTER | |
| 2 M.H./WEEK STRAIGHT TIME $36.40 | $ 72.80 |
| **TOTAL OUTSIDE LABOR/WEEK** | **$10764.23** |

- **CLARK LABOR**

| | |
|---|---|
| LABORERS | |
| 96 M.H./WEEK STRAIGHT TIME $25.00 | $2400.00 |
| 36 M.H./WEEK STRAIGHT TIME AND 1/2 $37.50 | $1350.00 |
| **TOTAL CLARK LABOR/WEEK** | **$3750.00** |

- **P.D.C. SITE MANAGEMENT**

| | |
|---|---|
| PROJECT MANAGER | |
| 55 M.H./WEEK STRAIGHT TIME $50.00 | $2750.00 |
| SITE VEHICLE | |
| 40 HOURS/WEEK STRAIGHT TIME $7.50 | $ 300.00 |
| OFFICE TRAILER | |
| 40 HOURS/WEEK STRAIGHT TIME $2.00 | $ 80.00 |
| **TOTAL P.D.C. SITE / WEEK** | **$3130.00** |

- **P.D.C. DISPOSAL FEES**

| | |
|---|---|
| 125 LOADS/WEEK = 2875 CU.YDS/WEEK | |
| 2875 CU.YDS. @ 123.21/CU.YD. | $354,228.75 |
| 119.73 | |
| **TOTAL P.D.C. DISPOSAL FEES/WEEK** | **$354,228.75** |

- T/M COST PER WEEK SUMMARY

| | |
|---|---|
| TOTAL EQUIPMENT | $11,217.12 |
| TOTAL CONTRACT LABOR | $10,764.23 |
| TOTAL CLARK LABOR | $ 3,750.00 |
| TOTAL P.D.C. SITE MANAGEMENT | $ 3,130.00 |
| TOTAL P.D.C. DISPOSAL FEES | $354,228.00 |
| **PROJECTED TOTAL COST PER WEEK** | **$383,089.35** |

6.7%

## PROJECT SUMMARY

### LOADS OUT TO LANDFILL

| MONTH | NUMBER OF LOADS | TOTAL VOLUME (C.Y.) | TOTAL WEIGHT (TONS) | TOTAL COST PER CU. YI |
|---|---|---|---|---|
| AUGUST | 13 | 293 | 287.92 | — |
| SEPTEMBER | 223 | 5,105 | 5,204.05 | $ 166. |
| OCTOBER | 499 | 11,435 | 11,643.42 | $ 152.( |
| NOVEMBER | 479 | 11,459 | 11,667.86 | $ 140. |
| TOTAL | 1,214 | 28,292 | 28,803.25 | $ 152. |

### PROJECTED COSTS

| MONTH | NUMBER OF LOADS | TOTAL VOLUME (C.Y.) | TOTAL COST/CU.YD. | TOTAL COST/MONTH |
|---|---|---|---|---|
| DECEMBER | 300 | 7,177 | $140.37 | $1,007,435.49 |
| JANUARY | 450 | 10,765 | $140.37 | $1,511,083.05 |
| FEBRUARY | 250 | 5,981 | $140.37 | $ 839,552.97 |
| TOTAL | 1,000 | 23,923 | $140.37 | **$3,358,071.51** |

NOTE: THE TOTAL COST PER CU. YD. INCLUDES ALL LABOR, MATERIAL, AND EQUIPMENT.

**TOTAL COST PER 100 LOADS (2392.3 CU.YD.) $335,807.16**

# ENVIROMMETRICS

2345 Millpark Drive
Maryland Heights, MO 63043
(314) 427-0550

CLARK OIL & REFINING CORPORATION
P.O. BOX 7
HAWTHORNE STREET
HARTFORD, IL 62048

ATTN: MO MODARRES

INVOICE # 24255
PO # 748187

## TCLP VOLATILE ORGANIC ANALYSIS
## METHOD SW-846 8240

SAMPLE ID: GUARD BASIN SLUDGE
LAB ID: 9312638

| CAS NUMBER | | REGULATORY LEVEL µg/L | PRACTICAL QUANTITATION LIMIT | RESUL |
|---|---|---|---|---|
| 75-01-4 | Vinyl Chloride | 200 | 100 µg/l | U µg/ |
| 75-35-4 | 1,1-Dichloroethene | 700 | 50 | U |
| 67-66-3 | Chloroform | 6,000 | 200 | U |
| 107-06-2 | 1,2-Dichloroethane | 500 | 50 | U |
| 78-93-3 | 2-Butanone | 200,000 | 150 | 130BJ |
| 56-23-5 | Carbon Tetrachloride | 500 | 50 | U |
| 79-01-6 | Trichloroethene | 500 | 50 | U |
| 71-43-2 | Benzene | 500 | 50 | 21J |
| 127-18-4 | Tetrachloroethene | 700 | 50 | U |
| 108-90-7 | Chlorobenzene | 100,000 | 50 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 7,500 | 100 | U |

## TCLP SEMIVOLATILE ORGANIC COMPOUNDS
## METHOD SW-846 8270

SAMPLE ID: GUARD BASIN SLUDGE
LAB ID: 9312638

| CAS NUMBER | | REGULATORY LEVEL µg/L | PRACTICAL QUANTITATION LIMIT | RESULT |
|---|---|---|---|---|
| 110-86-1 | Pyridine | 5,000 | 500 µg/l | U µg/l |
| 95-48-7 | o-Cresol | 200,000 | 100 | U |
| 106-44-5 | m & p-Cresol | 200,000 | 100 | U |
| 67-72-1 | Hexachloroethane | 3,000 | 100 | U |
| 98-95-3 | Nitrobenzene | 2,000 | 100 | U |
| 87-68-3 | Hexachlorobutadiene | 500 | 100 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 2,000 | 100 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 400,000 | 100 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 3,000 | 100 | U |
| 118-74-1 | Hexachlorobenzene | 130 | 100 | U |
| 87-86-5 | Pentachlorophenol | 100,000 | 100 | U |

U = UNDETECTED
B = PRESENT IN BLANK
J = DETECTED, BUT BELOW PRACTICAL
QUANTITATION LIMIT

DECEMBER 22, 1993

DATE COLLECTED : 12/06/93
DATE RECEIVED : 12/13/93
DATE ANALYZED : 12/16/93

WLCooper
WAYNE L. COOPER
LABORATORY DIRECTOR

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043
(314) 427-0550

CLARK OIL & REFINING CORPORATION.
P.O. BOX 7
HAWTHORNE STREET
HARTFORD, IL 62048

ATTN: MO MODARRES

INVOICE # 24255
PO # 748187

TCLP VOLATILE ORGANIC ANALYSIS
METHOD SW-846 8240

SAMPLE ID: TCLP BLANK
LAB ID: TBBLK2445A

| CAS NUMBER | | REGULATORY LEVEL µg/L | PRACTICAL QUANTITATION LIMIT | RESUL |
|---|---|---|---|---|
| 75-01-4 | Vinyl Chloride | 200 | 100 µg/l | U µg/ |
| 75-35-4 | 1,1-Dichloroethene | 700 | 50 | U |
| 67-66-3 | Chloroform | 6,000 | 200 | U |
| 107-06-2 | 1,2-Dichloroethane | 500 | 50 | U |
| 78-93-3 | 2-Butanone | 200,000 | 150 | 140BJ |
| 56-23-5 | Carbon Tetrachloride | 500 | 50 | U |
| 79-01-6 | Trichloroethene | 500 | 50 | U |
| 71-43-2 | Benzene | 500 | 50 | U |
| 127-18-4 | Tetrachloroethene | 700 | 50 | U |
| 108-90-7 | Chlorobenzene | 100,000 | 50 | U |
| 106-46-7 | 1,4-Dichlorobenzene | 7,500 | 100 | U |

TCLP SEMIVOLATILE ORGANIC COMPOUNDS
METHOD SW-846 8270

SAMPLE ID: TCLP BLANK
LAB ID: TASBLK4316

| CAS NUMBER | | REGULATORY LEVEL µg/L | PRACTICAL QUANTITATION LIMIT | RESULT |
|---|---|---|---|---|
| 110-86-1 | Pyridine | 5,000 | 500 µg/l | U µg/l |
| 95-48-7 | o-Cresol | 200,000 | 100 | U |
| 106-44-5 | m & p-Cresol | 200,000 | 100 | U |
| 67-72-1 | Hexachloroethane | 3,000 | 100 | U |
| 98-95-3 | Nitrobenzene | 2,000 | 100 | U |
| 87-68-3 | Hexachlorobutadiene | 500 | 100 | U |
| 88-06-2 | 2,4,6-Trichlorophenol | 2,000 | 100 | U |
| 95-95-4 | 2,4,5-Trichlorophenol | 400,000 | 100 | U |
| 121-14-2 | 2,4-Dinitrotoluene | 3,000 | 100 | U |
| 118-74-1 | Hexachlorobenzene | 130 | 100 | U |
| 87-86-5 | Pentachlorophenol | 100,000 | 100 | U |

U = UNDETECTED
B = PRESENT IN BLANK
J = DETECTED, BUT BELOW PRACTICAL QUANTITATION LIMIT

DECEMBER 22, 1993

DATE COLLECTED : ---
DATE RECEIVED : ---
DATE ANALYZED : 12/15 & 16/93

Wl Cooper
WAYNE L. COOPER
LABORATORY DIRECTOR

ENVIRONMETRICS
2345 Millpark Drive
Maryland Heights, MO 63043
(314) 427-0550

CLARK OIL & REFINING CORPORATION
P.O. BOX 7
HAWTHORNE STREET
HARTFORD, IL 62048

ATTN: MO MODARRES

INVOICE # 24255
PO # 748187

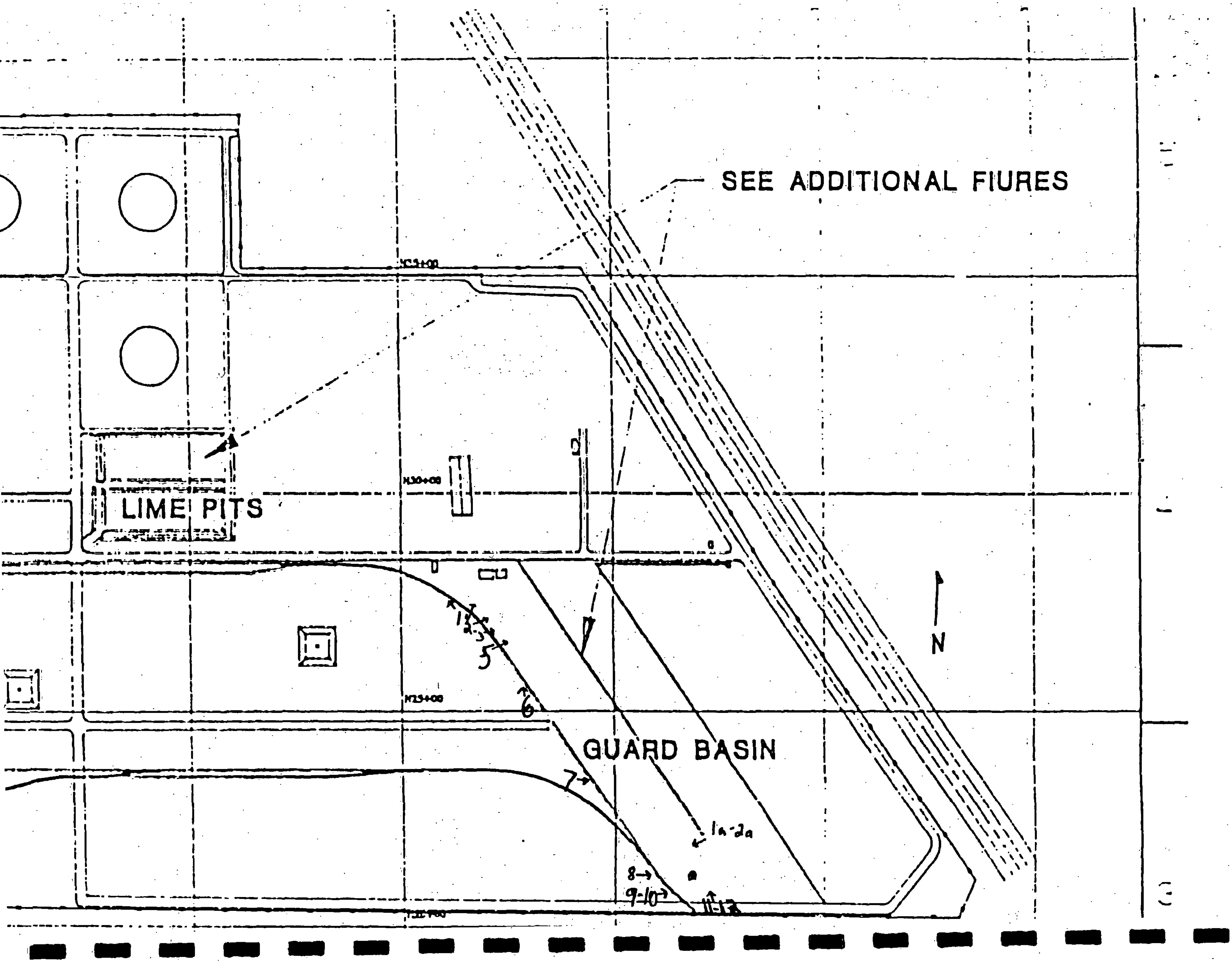
# ANALYSIS RESULTS

SAMPLE ID: GUARD BASIN SLUDGE
LAB ID: 9312638
DATE COLLECTED: 12/06/93

| TEST PERFORMED | METHOD OF ANALYSIS | REGULATORY LEVEL | RESULTS | | ANALYST |
|---|---|---|---|---|---|
| TCLP EXTRACTION | SW-846 1311 | | | | |
| METALS ANALYSIS | SW-846 6010 | | EXTRACTION | | |
| ARSENIC | | 5.0 | <0.200 | mg/l | 12/20/93 B.( |
| BARIUM | | 100.0 | 0.964 | | |
| CADMIUM | | 1.0 | <0.005 | | |
| CHROMIUM | | 5.0 | 0.574 | | |
| LEAD | | 5.0 | <0.100 | | |
| SELENIUM | | 1.0 | <0.200 | | |
| SILVER | | 5.0 | <0.040 | | |
| MERCURY | SW-846 7470 | 0.2 | <0.0002 | | |
| IGNITABILITY (SETAFLASH) | SW-846 1020 | | >200 | (°F) | 12/21/93 C.I |
| CORROSIVITY (pH) | SW-846 9045 | | 6.98 | | 12/20/93 C.I |
| REACTIVE CYANIDE | SW-846 9010 | | <0.2 | mg/kg | 12/21/93 C.I |
| REACTIVE SULFIDE | SW-846 9030 | | 2.27 | mg/kg | 12/20/93 S.I |
| PHENOLS | SW-846 9065 | | 20.31 | mg/kg | 12/22/93 R.I |
| PAINT FILTER | SW-846 9095 | NO FREE LIQUID (PASSED) | | | 12/21/93 S.I |

DECEMBER 22, 1993

W L Cooper MCA
WAYNE L. COOPER
LABORATORY DIRECTOR


SEE ADDITIONAL FIURES
LIME PITS
N30+00
N25+00
GUARD BASIN
N
5
6
7
8
9-10
1a-2a

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

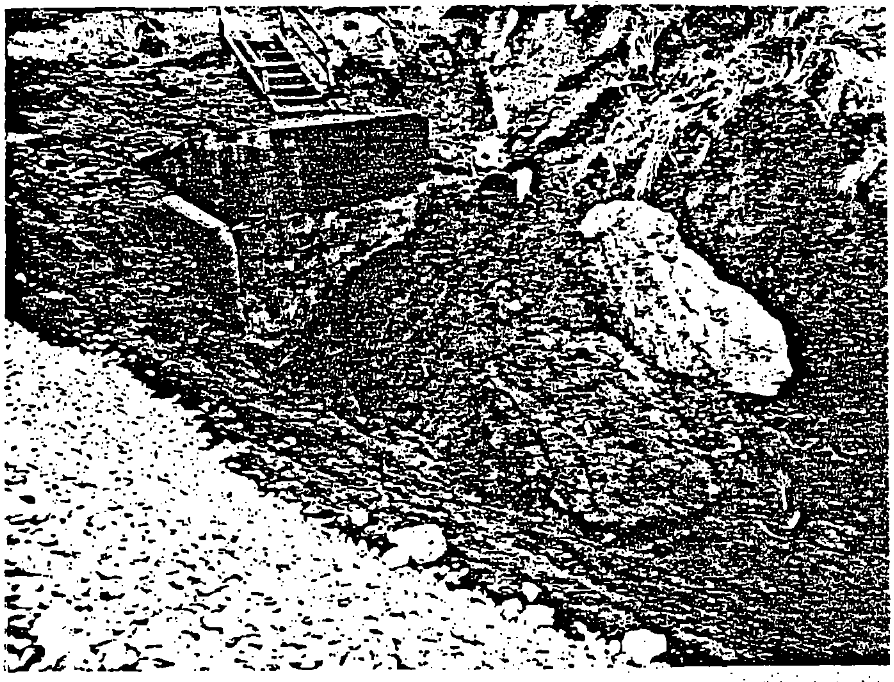
Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Northwest

ROLL# 2270 PHOTO# 1

PHOTOGRAPH BY:



DATE:

TIME:

I.D

COUNTY

PHOTOGRAPH TAKEN TOWARD THE:

ROLL# PHOTO#

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

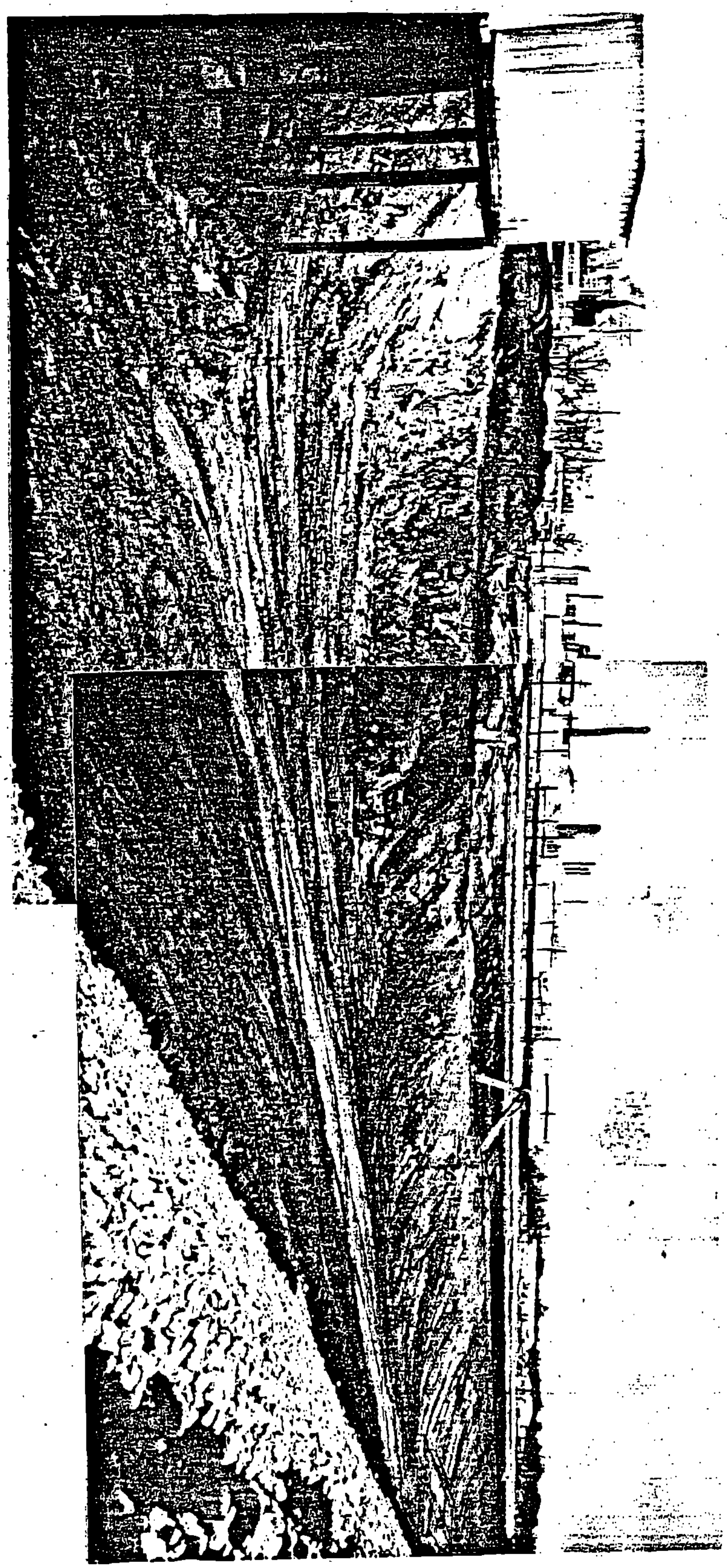
Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Northeast

ROLL# 2270 PHOTO# 2

PHOTOGRAPH BY:



DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Northeast

ROLL# 2270 PHOTO# 3

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

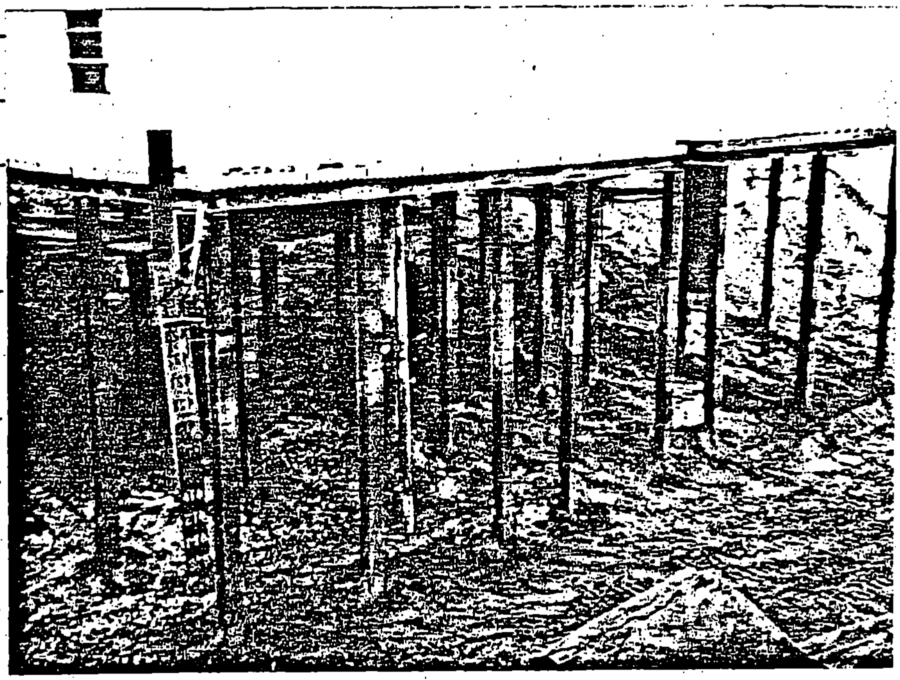
Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

North Northeast

ROLL# 2270 PHOTO# 4

PHOTOGRAPH BY:



DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Northeast

ROLL# 2270 PHOTO# 5

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

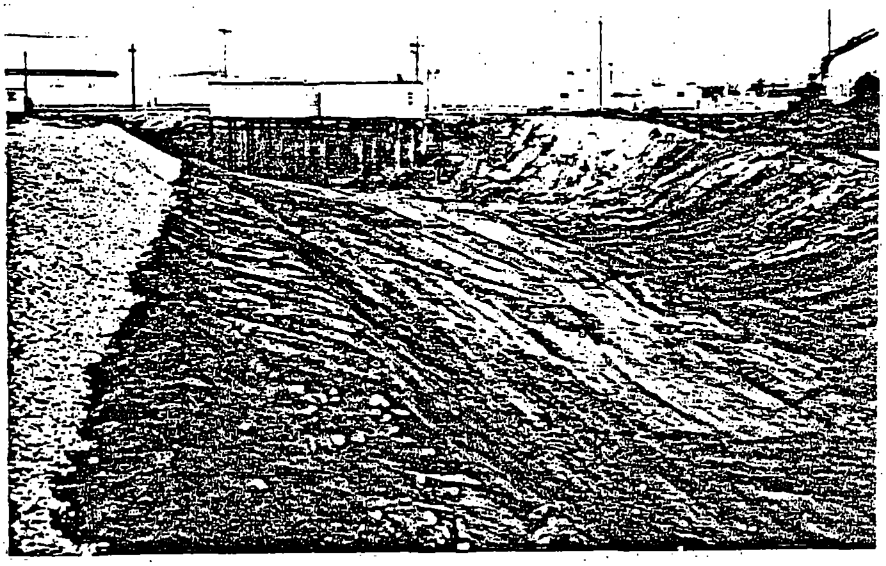
Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

North

ROLL# 2270 PHOTO# 6

PHOTOGRAPH BY:



DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

East

ROLL# 2270 PHOTO# 7

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

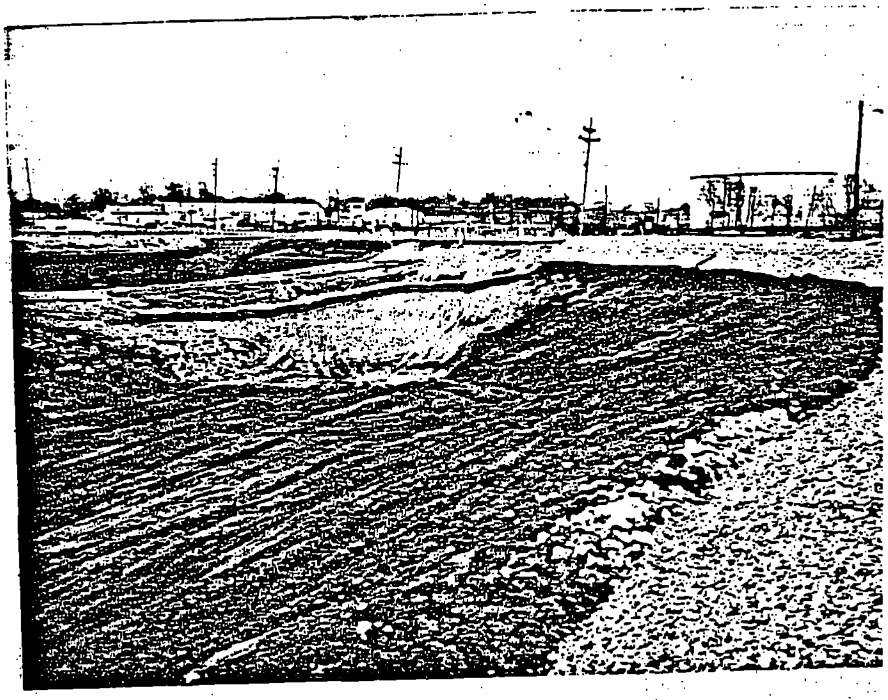
Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

East

ROLL# 2270 PHOTO# 8

PHOTOGRAPH BY:



DATE:

TIME:

I.D

COUNTY

PHOTOGRAPH TAKEN TOWARD THE:

ROLL# PHOTO#

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

East

ROLL# 2270 PHOTO# 9

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

East

ROLL# 2270 PHOTO# 10

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Northwest

ROLL# 2270 PHOTO# 11

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:15 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Northwest

ROLL# 2270 PHOTO# 12

PHOTOGRAPH BY:

DATE: January 3, 1994

TIME: 2:00 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

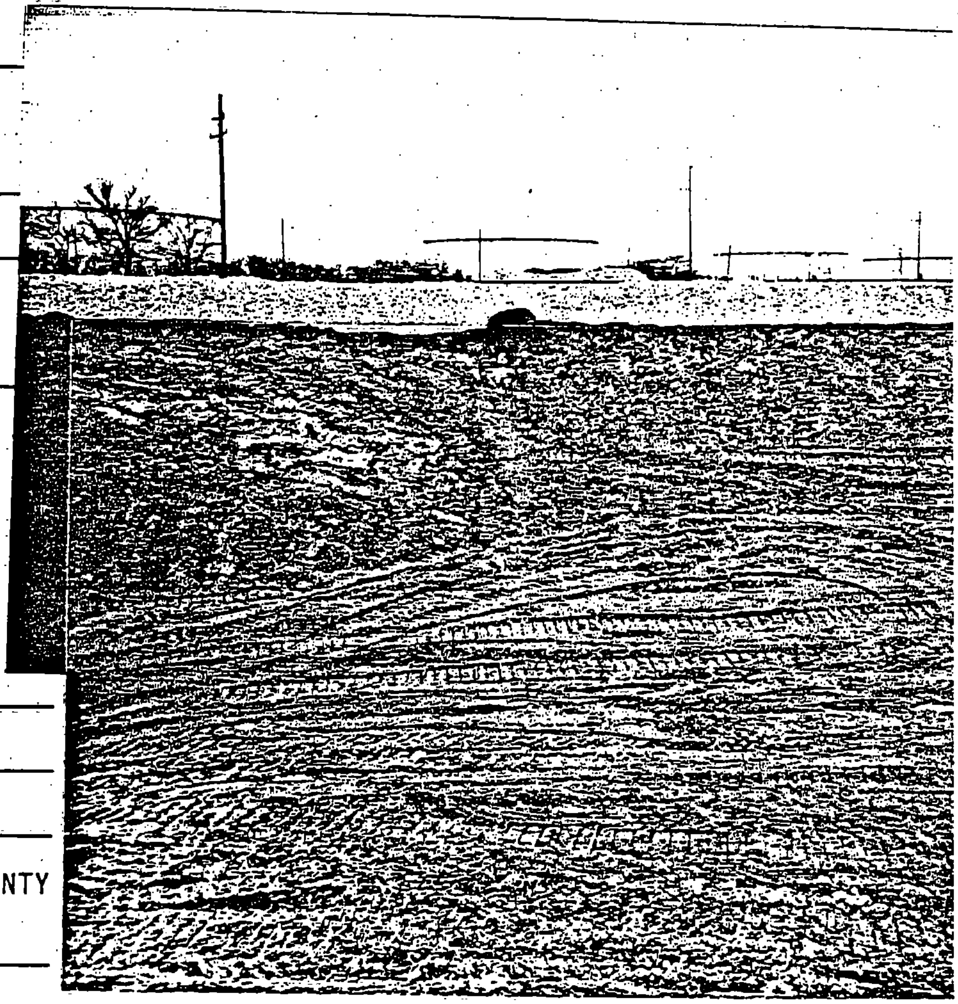
Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Southwest

ROLL# 2272 PHOTO# 1a

PHOTOGRAPH BY:



DATE: January 3, 1994

TIME: 2:00 - 3:00 p.m.

I.D 1190500002

Madison COUNTY

Clark Oil & Refining

PHOTOGRAPH TAKEN TOWARD THE:

Southwest

ROLL# 2272 PHOTO# 2a

PHOTOGRAPH BY:

94-528

1190500002
Clark Oil
SF/tech

BLACK & VEATCH Waste Science, Inc.

Source: IEPA BOL

4717 Grand Avenue, Suite 500, P.O. Box 30240, Kansas City, Missouri 64112, (913) 339-2900

Clark Refining and Marketing, Hartford, IL
Guard Basin Removal Action

BVWS Project 40466.100
BVWS File C.4
May 24, 1994

Illinois Environmental Protection Agency
Remedial Project Management Section
Bureau of Land
2200 Churchill Road
Springfield, IL 62794-9276

Subject: Work Plan/Quality Assurance Project Plan Revisions

Attention: Mr. John Sherrill

Gentlemen:

Enclosed is the addendum to the Work Plan and Quality Assurance Project Plan addressing revisions made to the reports as a result of comments received from the Illinois Environmental Protection Agency (IEPA) during a meeting on May 11, 1994 at the Hartford Refinery, and per a telephone conversation on May 19, 1994. Clark Refining and Marketing concurred with all of the IEPA comments and changes have been made to both documents to reflect these comments.

If you have any questions, please call me at 913/338-6647.

Very truly yours,

Black & Veatch Waste Science, Inc.

Clyde Hutchison

Clyde Hutchison, P.E.
Project Manager

bla
Enclosure

cc: Chris Cahnovsky/IEPA
Bill Irwin/Clark Hartford Refinery
Patricia Sharkey/Meyer, Brown & Platt
File

RECEIVED
JUN 02 1994
IEPA/DLPC

ORIGINAL

Work Plan/Quality Assurance Project Plan Addendum
Guard Basin Removal Action
Clark Refining and Marketing
Hartford, IL

Based on comments received from John Sherrill of the Illinois Environmental Protection Agency (IEPA) and per this addendum, the following revisions are incorporated into the Work Plan and Quality Assurance Project Plan, dated February 1994. The comments were received as a result of meeting on May 11, 1994, and per a telephone conversation on May 19, 1994. All of the comments made by IEPA will be complied with and incorporated into the plans.

Work Plan Revisions

1. Replace Section 3.4, Soil Sampling Activities, with the attached revised version of Section 3.4.
2. Groundwater samples will be collected semi-annually for a period of two years, rather than quarterly for a period of one year, as stated in Section 3.3.3, Monitoring Program. However, groundwater elevations will be measured quarterly for a period of two years.

Quality Assurance Project Plan Revisions

1. Groundwater purged from the monitoring wells will be containerized and disposed of in the refinery's wastewater treatment system.
2. The probe and cable used to measure ground water elevations will be decontaminated between well measurements by washing with a laboratory detergent solution and rinsing with distilled water.
3. After measuring the groundwater elevation in a well, the depth to the bottom of the well will be measured to determine if sandy or silty materials have deposited in the well.
4. To demonstrate that groundwater quality stabilizes during purging and sampling of the monitoring wells, the pH, temperature, and conductivity of the groundwater will be measured periodically during the purging and sampling process. At a minimum, measurements of these field parameters will be collected before purging, after 1.5 well volumes have been removed from the well, and after collecting the groundwater sample.

## 3.4 Soil Sampling Activities

Composite and discrete soil samples will be collected from surface and shallow subsurface soils as described in the following subsections.

### 3.4.1 Surface Soil Sampling

In addition to visual verification to confirm the complete removal of sludge, discrete and composite surface soil samples will be collected from the bottom of the east and west sides of the Guard Basin. The discrete and composite samples will allow contaminant characterization over the entire bottom of the basin. To collect these samples, the bottom of the basin will be partitioned into a grid system consisting of sixteen cells on each side of the basin as shown on Figure 2. No samples will be collected from the side slopes of the basins.

Eight discrete soil samples designated as DS-1 through DS-16 will be collected from the bottom of each side of basin as shown on Figure 2 to provide samples that are the most representative of the bottom of the basin. Discrete samples DS-1 through DS-8 will be collected from the west side of the basin, and samples DS-9 through DS-16 will be collected from the east side of the basin. The discrete soil samples will be collected from the center of each cell as indicated on the figure. Before collecting each sample, the top 3 inches of surface soil will be scraped away using a stainless steel spoon or scoop. The samples to be submitted for analyses will be collected using a stainless steel spoon or scoop from a depth between 3 and 6 inches below ground surface. Discrete soil samples will be submitted for analyses of constituents on the Skinner List. This list includes metals and volatile and semivolatile organic compounds.

One composite sample will be collected from each side of the basin. Sample aliquots will be collected from the center of cells with the designations CS-1 through CS-16. Sample aliquots CS-1 through CS-8 will be combined to form the composite sample from the west side of the basin, and sample aliquots CS-9 through CS-16 will be combined to form the composite sample from the east side of the basin. The sample aliquots will be collected in the same manner as the discrete soil samples; however, the samples aliquots will be placed in a clean stainless steel bowl and mixed to form each composite sample. To provide an adequate quantity of soil for the composite samples, approximately six ounces of soil will be collected from each sample aliquot location. After compositing, the soil will be transferred to the appropriate sample containers. Composite soil samples will be submitted for analyses of constituents on the Skinner List.

### 3.4.2 Subsurface Soil Sampling

To determine the concentration of Skinner List constituents at various depths below the bottom of the Guard Basin, two shallow soil borings will be drilled in the bottom of each side of the basin. The borings will be hand-augered using a power auger, unless field conditions enable the borings to be drilled using a non-powered hand auger. The borings will be drilled at the same approximate locations as discrete samples DS-3, DS-6, DS-11, and DS-14 to provide subsurface soil data at the approximate locations of surface soil samples. The locations of soil borings SB-1 through SB-4 are shown on Figure 2. Two discrete subsurface soil samples will be collected from each boring location at 6-inch sampling intervals. The first sampling interval will be from approximately 2.5 to 3 feet below ground surface and the second interval will be from approximately 4.5 to 5 feet below ground surface. The samples will be collected by advancing the power auger to the start of the sampling interval, and using a stainless steel bucket or Oakfield-type sampler to collect the subsurface soil samples. The sampler will be decontaminated between each soil sample collected, and the auger will be decontaminated between each boring location. After sample collection, the soil cuttings will be spread in the bottom of the basin. All of the bore holes will be filled with dry bentonite chips or pellets (Hole Plug or equivalent) and hydrated to prevent the potential downward migration of contaminants. The subsurface soil samples will be submitted for analyses of the metals and volatile and semivolatile organic compounds on the Skinner List. If split samples are requested from the soil boring samples by IEPA, additional shallow borings may have to be drilled adjacent to the initial boring locations to provide an adequate volume of soil for sample analysis.

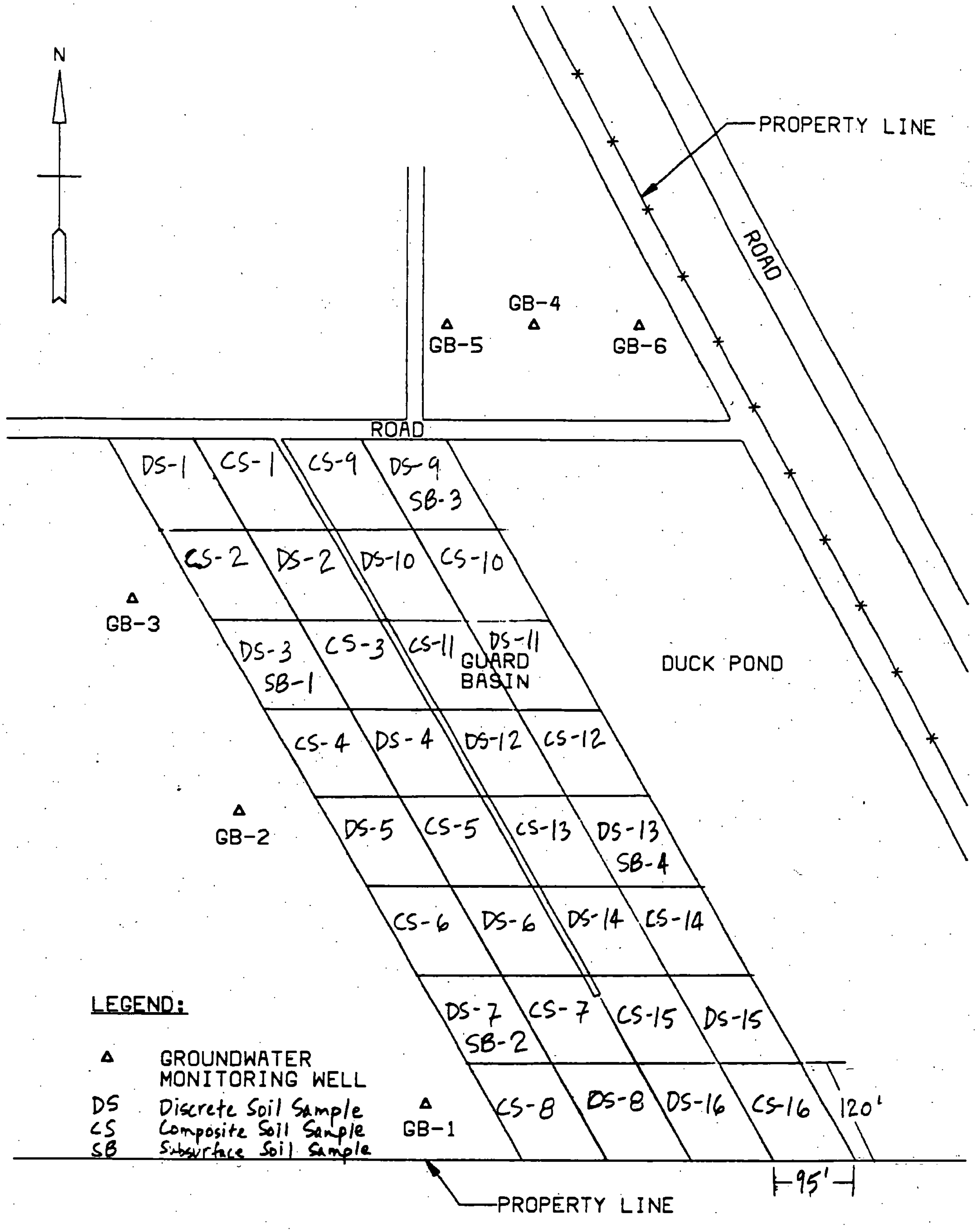



FIGURE 2
GUARD BASIN SITE MAP
CLARK OIL AND REFINING

# SITE INVESTIGATION REPORT
# FOR
# THE GUARD BASIN AREA
# CLARK REFINING AND MARKETING, INC.
# HARTFORD, ILLINOIS

**December 1996**

**94-155-4-059**

**Burns & McDonnell Waste Consultants, Inc.**
**Engineers - Geologists - Scientists**
**St. Louis, Missouri**

## TABLE OF CONTENTS

## LIST OF FIGURES



## LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 GENERAL

The following describes the site investigation activities used to further characterize the condition of the Guard Basin area (Site) for Clark Refining & Marketing, Inc. (Clark) in Hartford, Illinois. This site investigation report provides: a description of the field work performed; methods, procedures, and analyses used; chemical analytical data; and a summary of contaminant occurance. The location of the Site, which has historically been used as a depository for liquid wastes generated at the refinery, is illustrated on Figure 1.

* * * * *

# 2.0 HYDROGEOLOGY

## 2.1 REGIONAL HYDROGEOLOGY

The Site lies within the Alluvial Valleys Region as defined in United States Geological Survey Water-Supply Paper 2242, 1984. The Alluvial Valleys Region is commonly underlain by sand and gravel as well as silt and clay. The surficial deposit of sand and gravel is commonly underlain by interbedded silt and clay in turn underlain by a basal layer of sand and gravel. Locally, these units are collectively known as Cahokia Alluvium. The subsurface material in the Site area consists of Quarternary Alluvium, which is made up of modern river floodplain deposits of poorly-sorted sands, silts, and clays with some sandy gravel. The alluvium ranges in thickness from 50 to 200 feet below the ground surface (bgs).

The sequence of deposits in the Alluvial Valleys Region is dependant on the depositional history. The sands and gravels in the valleys of major streams, such as the Mississippi River, are commonly overlain by deposits of clay and other fine-grained alluvium deposited during floods following the end of the glacial period.

The alluvial deposits are recharged by precipitation on the valleys, groundwater moving from the adjacent and underlying aquifers, and overbank flooding of the streams. Water in the alluvial deposits discharges to the streams in the valleys.

The underlying bedrock in the Hartford area is composed of Mississippian age interbedded limestones, sandstones, and shales of the Lower Chesterian Series. Regionally, these units dip east toward the center of the Illinois Basin. The Illinois Basin is the major geologic structure in the region.

## 2.2 LOCAL HYDROGEOLOGY

Soil borings were completed to a maximum of 6 feet below ground surface (bgs) at this location. Sediments encountered during drilling included mainly black sand and clay. Groundwater was not encountered during drilling.

* * * * *

## 3.0 FIELD INVESTIGATION ACTIVITIES

To determine the approximate vertical and horizontal extent of contamination at the Site, 18 surface soil samples were collected and 4 soil borings were augered and sampled. Mr. Tom Miller of the Illinois Environmental Protection Agency (IEPA) was present during sampling. The sampling locations were evenly distributed across the Guard Basin and are shown on Figure 2.

### 3.1 SURFACE SOIL SAMPLE COLLECTION

To evaluate the Site, 18 surface soil samples were collected and analyzed for volatile organics by United States Environmental Protection Agency (EPA) Method 8260A, semi-volatile organics by EPA Method 8270B, and for metals using EPA Method SW-846 protocol. Of the 18 soil samples collected, 16 were discreet samples from every other square of a grid covering the Guard Basin. Two soil samples were composites of 8 aliquots each, collected from the remaining sections of the grid and representing the eastern and western halves of the Guard Basin, respectively. Surface soil samples were collected at a depth of 3 to 6 inches below ground surface (bgs) to insure sampling of native soil. Soil samples were placed in laboratory-cleansed jars after collection.

### 3.2 AUGERING AND SUBSURFACE SOIL SAMPLE COLLECTION

Four soil borings were augered and sampled in the Guard Basin using a stainless steel hand auger. Each boring was completed to a depth of 6 feet bgs. Samples were collected from the intervals of 2.5-3' and 4.5-5' bgs in each boring and analyzed for metals by EPA Method SW-846, volatile organics by EPA Method 8260A, and semi-volatile organics by EPA Method 8270B. Soil samples were removed from the stainless steel hand auger with minimal disturbance and placed in laboratory-cleansed jars.

### 3.3 SAMPLE COLLECTION PROTOCOL

Personnel responsible for activities associated with collection of soil samples followed standard procedures to reduce the possibility of contamination and cross-contamination of the samples prior to delivery to the laboratory. Clean, decontaminated, stainless steel sampling equipment was used at each sampling location. Sampling equipment was decontaminated before the collection of each sample. Soil samples were placed in a cooler with ice and promptly delivered to the analytical laboratory using chain-of-custody procedures. All laboratory analyses were performed in accordance with EPA methodology by TEKLAB, Inc. of Collinsville, Illinois. The laboratory results and chain-of-custody forms for surface soil samples are included in Appendix A.

* * * * *

# 4.0 CONTAMINANT OCCURRENCE

Eighteen surface and eight subsurface soil samples were collected and submitted for laboratory chemical analysis to delineate the approximate horizontal and vertical extent of soil impact. The analytical laboratory reports are contained in Appendix A.

## 4.1 SURFACE SOIL SAMPLES

The results of surface soil sample analyses are summarized in Table 1. Of the 18 surface soil samples analyzed, 4 are below the Illinois EPA Tiered Approach to Cleanup Objectives (TACO) Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties. Surface soil samples DS-5 through DS-8 are below TACO Tier 1 values for all compounds analyzed. The remaining 14 surface soil samples all exceed TACO Tier 1 values for at least one Metal by the Toxicity Characteristic Leachate Procedure (TCLP). Surface soil samples DS-10 through DS-14 exceed the TACO value for chromium, samples DS-3, DS-4, DS-10, DS-15, C-East, and C-West exceed the TACO value for lead, samples DS-1, DS-2, and DS-10 through DS-12 exceed the TACO value for nickel, and samples DS-9 and DS-11 exceed the TACO value for vanadium. In addition, surface soil sample DS-3 exceeds the TACO Tier 1 value for the Semi-volatile compound benzo(a)anthracene. However, the detection limits for benzo(a)anthracene in the other samples all exceed TACO values. Benzene and chrysene detection limits are also exceeded for a few samples.

In addition to the analysis of Metals by TCLP, the samples were also analyzed for Total Metals. As these values are not comparable with the TCLP values, they are compared instead with TACO Table F, Range of Concentrations of Inorganic Chemicals in Background Soils. Of the 18 soil samples compared with these background concentrations, all samples are within background ranges for barium, cadmium, cobalt, lead, mercury, and nickel. Soil samples DS-1, DS-2, DS-9 through DS-13, and the east and west composite samples (C-East, C-West) all exceed the upper limit of the background concentrations for chromium. In addition, soil samples DS-1, DS-9, and DS-10 exceed the upper limit of the background concentrations for vanadium.

## 4.2 SUBSURFACE SOIL SAMPLES

Eight subsurface soil samples were collected from four soil borings and submitted for laboratory analysis. Of the eight subsurface soil samples analyzed, three exceed TACO Tier 1 values for one or more semi-volatile organic compound and three exceed TACO Tier 1 values for one Metal by TCLP. Soil samples SB-1-1, SB-1-2 and SB-3-2 all exceed the TACO Tier 1 value for Benzo(a)anthracene. In addition, soil sample SB-1-1 exceeds the TACO Tier 1 value for chrysene. Soil samples SB-2-1 and SB-4-1 exceed the TACO value for lead and sample SB-3-1 exceeds the TACO value for vanadium. All subsurface soil samples are below the TACO Tier 1 values for volatile organics. Similar to the preceding section, the detection limits for benzo(a)anthracene and benzene exceed the TACO Tier 1 values for some or all samples, and are therefore unreliable indications of sample compliance.

As explained above, Total Metals concentrations are compared with TACO Table F background values. All eight soil samples are well within the background ranges given for metals. The results of subsurface soil sample analyses are summarized in Table 2.

* * * * *

## 5.0 CONCLUSIONS

- One of eighteen surface samples, and three of eight subsurface samples, exceed TACO Tier 1 values for benzo(a)anthracene. One subsurface soil sample exceeds the TACO Tier 1 value for chrysene.

- Fourteen of the eighteen surface samples, and three of the eight subsurface samples, exceed the TACO Tier 1 values for Metals by TCLP.

- No surface or subsurface soil samples exceed TACO Tier 1 values for volatile organics.

- Nine of eighteen surface soil samples exceed the upper limit of the TACO background ranges for Chromium. Of those nine samples, four also exceed TACO background ranges for Vanadium. All subsurface soil samples are within the TACO background ranges.

* * * * *

# Summary of Surface Analytical Results
## Clark Refining & Marketing, Inc.
## Guard Basin Area
## Hartford, Illinois

| Sample Number: | | TACO | DS-1 | DS-2 | DS-3 | DS-4 | DS-5 | DS-6 | DS-7 | DS-8 | DS-9 | DS-10 | DS-11 | DS-12 | DS-13 | DS-14 | DS-15 | DS-16 | C-EAST | C-WEST |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | T- 1 CUO | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 |
| **Total Metals[1]** | | | | | | | | | | | | | | | | | | | | |
| Barium | mg/Kg | ** | 210 | 180 | 70 | 140 | 38 | 180 | 32 | 200 | 210 | 200 | 220 | 190 | 200 | 180 | 240 | 110 | 200 | 180 |
| Cadmium | mg/Kg | ** | ND(0.70) | ND (0.69) | ND(0.67) | ND(0.69) | ND(0.67) | ND(0.69) | ND(0.68) | ND(0.69) | 0.98 | 1.23 | 1.2 | 1.10 | ND(0.69) | ND(0.71) | ND(0.69) | ND(0.70) | ND(0.59) | 0.69 |
| Chromium | mg/Kg | ** | 235 | 198 | 146 | 88.7 | 8.61 | 86.1 | 18.1 | 72.6 | 190 | 286 | 414 | 308 | 239 | 148 | 80.7 | 31.1 | 378 | 187 |
| Cobalt | mg/Kg | ** | 12.6 | 11.2 | ND(4.81) | ND(4.90) | ND(4.85) | 8.42 | ND(4.67) | 10.5 | 15.9 | 15.9 | 14.3 | 10.0 | 12.9 | 9.39 | 9.61 | 6.70 | 8.92 | 9.12 |
| Lead | mg/Kg | ** | 63.9 | 64.8 | 31.2 | 38.1 | ND(4.85) | 38.7 | ND(4.67) | 26.6 | 53.2 | 89.8 | 118 | 158 | 293 | 38.8 | 102 | 14.6 | 92.0 | 58.8 |
| Mercury | mg/Kg | ** | 0.05 | 0.07 | 0.07 | 0.03 | ND(0.01) | 0.04 | ND(0.01) | 0.02 | 0.06 | 0.10 | 0.03 | 0.06 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.06 |
| Nickel | mg/Kg | ** | 38.2 | 32.2 | 15.4 | 14.2 | 6.60 | 21.7 | 6.17 | 25.4 | 46.0 | 60.7 | 41.10 | 31.1 | 30.3 | 22.2 | 22.1 | 17.1 | 30.8 | 27.6 |
| Vanadium | mg/Kg | ** | 88 | 70 | 33 | 26 | 6.7 | 24 | 7.6 | 31 | 140 | 110 | 74 | 62 | 66 | 34 | 28 | 21 | 72 | 63 |
| **Metals by TCLP[1]** | | | | | | | | | | | | | | | | | | | | |
| Barium | mg/L | 2.0 | 0.7 | 0.9 | 0.6 | 1.1 | 1.3 | 0.9 | 1.8 | 0.9 | 0.6 | 1.4 | 0.4 | 0.7 | 1.4 | 1.0 | 0.7 | 2.0* | 0.7 | 0.7 |
| Cadmium | mg/L | 0.005 | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | 0.006* | ND(0.005) | ND(0.005) |
| Chromium | mg/L | 0.1 | 0.090 | 0.072 | 0.053 | ND(0.030) | ND(0.030) | ND(0.030) | ND(0.030) | ND(0.030) | 0.033 | 0.269* | 0.106* | 0.168* | 0.145* | 0.106* | ND(0.030) | ND(0.030) | 0.046 | ND(0.030) |
| Cobalt | mg/L | 1.0 | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | 0.088 | 0.058 | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | 0.055 | ND(0.050) |
| Lead | mg/L | 0.0075 | ND(0.05) | ND(0.05) | 0.1* | 0.08* | ND(0.05) | ND(0.05) | ND(0.05) | ND(0.05) | ND(0.05) | 0.12* | ND(0.05) | ND(0.05) | ND(0.05) | ND(0.05) | 0.05* | ND(0.05) | 0.08* | 0.08* |
| Mercury | mg/L | 0.002 | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | 0.0002 | 0.0002 |
| Nickel | mg/L | 0.1 | 0.12* | 0.12* | 0.09 | 0.04 | 0.03 | 0.08 | 0.03 | 0.06 | 0.06 | 0.23* | 0.16* | 0.1* | 0.08 | 0.04 | 0.02 | 0.08 | 0.07 | 0.07 |
| Vanadium | mg/L | 0.049 | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | 0.057* | 0.025 | 0.117* | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) |
| **Volatile Organics[2]** | | | | | | | | | | | | | | | | | | | | |
| Benzene | µg/Kg | 30 | ND(50)* | ND(50)* | ND(5) | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | 10.7 | ND(50)* | ND(50)* | ND(5) | ND(5) | ND(5) | ND(5) | ND(10) | ND(10) |
| Toluene | µg/Kg | 12,000 | ND(50) | ND(50) | 6.1 | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | 38.6 | ND(50) | ND(50) | 44.0 | 89.0 | ND(5) | ND(5) | 21.0 | ND(10) |
| Ethylbenzene | µg/Kg | 13,000 | ND(50) | ND(50) | ND(5) | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | 18.3 | ND(50) | ND(50) | 16.0 | 50.0 | ND(5) | ND(5) | 20.0 | ND(10) |
| Xylenes | µg/Kg | 190,000 | ND(50) | ND(50) | 29.8 | 9.4 | 15.4 | 9.0 | ND(10) | ND(5) | 14.8 | 97.9 | 59.6 | 212 | 118 | 360 | ND(5) | ND(5) | 111 | 10.0 |
| Isopropylbenzene | µg/Kg | | ND(50) | ND(50) | ND(5) | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | ND(10) | ND(50) | ND(50) | ND(5) | 12.0 | ND(5) | ND(5) | ND(10) | ND(10) |
| n-Propylbenzene | µg/Kg | | ND(50) | ND(50) | 5.4 | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | ND(10) | ND(50) | ND(50) | 10.0 | 21.0 | ND(5) | ND(5) | 12.0 | ND(10) |
| 1,3,5-Trimethylbenzene | µg/Kg | | 61.4 | 60.9 | 34.6 | 11.1 | ND(10) | 10.0 | ND(10) | 8.9 | 14.6 | 44.1 | 62.4 | 184 | 11.0 | 87.0 | ND(5) | ND(5) | 24.0 | ND(10) |
| tert-Butylbenzene | µg/Kg | | ND(50) | ND(50) | 8.0 | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | 22.0 | ND(50) | 101 | 6.0 | 28.0 | ND(5) | ND(5) | ND(10) | ND(10) |
| 1,2,4-Trimethylbenzene | µg/Kg | | 51.9 | 78.1 | 53.1 | 21.6 | 11.2 | 17.1 | 15.6 | 13.8 | 15.8 | 106 | 63.9 | 865 | 60.0 | 124 | ND(5) | ND(5) | 46.0 | ND(10) |
| sec-Butylbenzene | µg/Kg | | ND(50) | ND(50) | 8.2 | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | 13.8 | ND(50) | ND(50) | 6.0 | 8.0 | ND(5) | ND(5) | ND(10) | ND(10) |
| p-Isopropyltoluene | µg/Kg | | ND(50) | ND(50) | 11.8 | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | 11.4 | 23.8 | ND(50) | ND(50) | 15.0 | 26.0 | ND(5) | ND(5) | 11.0 | ND(10) |
| n-Butylbenzene | µg/Kg | | ND(50) | ND(50) | 19.3 | 5.5 | ND(10) | ND(5) | 14.6 | ND(5) | 13.1 | 51.6 | ND(50) | ND(50) | 12.0 | 32.0 | ND(5) | ND(5) | 17.0 | ND(10) |
| Napthalene | µg/Kg | 84,000 | ND(50) | ND(50) | ND(5) | ND(5) | ND(10) | ND(5) | ND(10) | ND(5) | ND(10) | ND(10) | ND(50) | ND(50) | 12.0 | 37.0 | ND(5) | ND(5) | ND(10) | ND(10) |
| **Semi-Volatile Organics[3]** | | | | | | | | | | | | | | | | | | | | |
| 2-Methylnaphthalene | mg/Kg | | 11.5 | 17.6 | 12.1 | ND(9.9) | ND(10) | ND(9.8) | ND(9.4) | ND(9.9) | 11.3 | 12.6 | ND(9.8) | ND(9.9) | ND(96.8) | ND(9.9) | ND(98.7) | ND(9.5) | ND(19.8) | ND(19.9) |
| Diethyl phthalate | mg/Kg | 470 | ND(9.0) | ND(9.9) | ND(9.9) | ND(9.9) | 16.4 | 17.4 | ND(9.4) | ND(9.9) | ND(9.9) | ND(9.8) | 16.5 | ND(9.9) | ND(96.8) | ND(9.9) | ND(98.7) | ND(9.5) | ND(19.8) | ND(19.9) |
| Phenanthrene | mg/Kg | | ND(9.0) | ND(9.9) | ND(9.9) | ND(9.9) | ND(10) | ND(9.8) | ND(9.4) | ND(9.9) | ND(9.9) | ND(9.8) | ND(9.8) | ND(9.9) | ND(96.8) | ND(9.9) | ND(98.7) | ND(9.5) | ND(19.8) | ND(19.9) |
| Fluoranthene | mg/Kg | 3100 | ND(9.0) | ND(9.9) | ND(9.9) | ND(9.9) | ND(10) | ND(9.8) | ND(9.4) | ND(9.9) | ND(9.9) | ND(9.8) | ND(9.8) | ND(9.9) | ND(96.8) | ND(9.9) | ND(98.7) | ND(9.5) | ND(19.8) | ND(19.9) |
| Pyrene | mg/Kg | 2300 | 9.29 | ND(9.9) | 38.3 | ND(9.9) | ND(10) | ND(9.8) | 31.9 | ND(9.9) | ND(9.9) | 10.2 | ND(9.8) | ND(9.9) | ND(96.8) | 11.7 | ND(98.7) | ND(9.5) | ND(19.8) | ND(19.9) |
| Benzo(a)anthracene | mg/Kg | 0.9 | ND(9.0)* | ND(9.9)* | 11.8* | ND(9.9)* | ND(10)* | ND(9.8)* | ND(9.4)* | ND(9.9)* | ND(9.9)* | ND(9.8)* | ND(9.8)* | ND(9.9)* | ND(96.8)* | ND(9.9)* | ND(98.7)* | ND(9.5)* | ND(19.8)* | ND(19.9)* |
| Chrysene | mg/Kg | 88 | 10.4 | ND(9.9) | 31.6 | ND(9.9) | ND(10) | ND(9.8) | 23.5 | ND(9.9) | ND(9.9) | ND(9.8) | ND(9.8) | ND(9.9) | ND(96.8)* | 11.2 | ND(98.7)* | ND(9.5) | ND(19.8) | ND(19.9) |

[1] - Metals analyzed by EPA Method SW846.
[2] - Volatile organics analyzed by EPA Method 8260A.
[3] - Semi-volatile organcis analyzed by EPA Method 8270B.
TCLP - Toxic Characteristics Leachate Procedure

mg/Kg - Milligram per kilogram
µg/Kg - Microgram per kilogram
TACO - IEPA Tiered Approach to Cleanup Objectives Tier 1, Table B Soil Cleanup Objectives for Industrial/Commercial Properties

11.8* - Compound exceeds TACO Tier 1 value
ND( ) - Not detected (detection limit)
ND( )* - Detection limit is above TACO Tier 1 value.

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[redacted]

# T[redacted]2

## Summary of Subsurface Analytical Results
## Clark Refining & Marketing, Inc.
## Guard Basin Area
## Hartford, Illinois

| Sample Number: | | TACO | SB-1-1 | SB-1-2 | SB-2-1 | SB-2-2 | SB-3-1 | SB-3-2 | SB-4-1 | SB-4-2 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | Units | T- 1 CUO' | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 | 10/10/96 |
| **Total Metals'** | | | | | | | | | | |
| Barium | mg/Kg | ** | ND(9.3) | 21 | 24 | 27 | 17 | ND(10) | 35 | 81 |
| Cadmium | mg/Kg | ** | ND(0.65) | ND(0.66) | ND(0.70) | ND(0.66) | ND(0.69) | ND(0.72) | ND(0.64) | ND(0.70) |
| Chromium | mg/Kg | ** | 2.99 | 3.40 | 3.70 | 5.79 | 5.74 | 3.06 | 29.6 | 92.0 |
| Cobalt | mg/Kg | ** | ND(4.67) | ND(4.85) | ND(5.00) | ND(4.67) | 5.05 | ND(5.10) | ND(4.59) | 7.90 |
| Lead | mg/Kg | ** | 6.36 | 9.71 | 5.00 | ND(4.67) | ND(4.95) | ND(5.10) | 28.9 | 88.6 |
| Mercury | mg/Kg | ** | ND(0.01) | ND(0.01) | ND(0.01) | ND(0.01) | ND(0.01) | ND(0.01) | ND(0.01) | 0.01 |
| Nickel | mg/Kg | ** | 6.92 | 7.09 | 4.20 | 6.97 | 13.6 | 7.86 | 14.9 | 14.7 |
| Vanadium | mg/Kg | ** | 7.7 | 4.4 | 6.0 | 6.3 | 7.7 | 5.8 | 14 | 19 |
| **Metals by TCLP'** | | | | | | | | | | |
| Barium | mg/Kg | 2.0 | 1.2 | 1.3 | 1.1 | 1.0 | 0.7 | 0.8 | 1.4 | 1.3 |
| Cadmium | mg/Kg | 0.005 | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) | ND(0.005) |
| Chromium | mg/Kg | 0.1 | ND(0.030) | ND(0.030) | ND(0.030) | ND(0.030) | ND(0.030) | ND(0.030) | ND(0.030) | 0.093 |
| Cobalt | mg/Kg | 1.0 | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) | ND(0.050) |
| Lead | mg/Kg | 0.0075 | ND(0.05) | ND(0.05) | 0.05* | ND(0.05) | ND(0.05) | ND(0.05) | 0.14* | ND(0.05) |
| Mercury | mg/Kg | 0.002 | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) | ND(0.0002) |
| Nickel | mg/Kg | 0.1 | ND(0.02) | ND(0.03) | ND(0.02) | 0.08 | 0.03 | 0.02 | 0.04 | 0.03 |
| Vanadium | mg/Kg | 0.049 | ND(0.020) | ND(0.020) | ND(0.020) | ND(0.020) | 0.150* | ND(0.020) | ND(0.020) | ND(0.020) |
| **Volatile Organics** | | | | | | | | | | |
| Benzene | µg/Kg | 30 | ND(10) | ND(10) | ND(10) | ND(50)* | ND(10) | ND(50)* | ND(50)* | ND(250)* |
| Toluene | µg/Kg | 12,000 | 41.0 | 61.0 | 17.0 | ND(50) | 47.0 | 194 | ND(50) | ND(250) |
| Ethylbenzene | µg/Kg | 13,000 | 22.0 | 37.0 | ND(10) | ND(50) | 50.0 | 164 | ND(50) | 324 |
| Xylenes | µg/Kg | 190,000 | 360 | 391 | 34.0 | 213 | 423 | 1258 | 337 | 2028 |
| Isopropylbenzene | µg/Kg | | ND(10) | 18.0 | ND(10) | ND(50) | 14.0 | ND(10) | ND(50) | ND(10) |
| n-Propylbenzene | µg/Kg | | 10.0 | 16.0 | ND(10) | 103 | 20.0 | ND(10) | ND(50) | 1436 |
| 1,3,5-Trimethylbenzene | µg/Kg | | 208 | 290 | 29.0 | 419 | 58.0 | 150 | 622 | 4374 |
| tert-Butylbenzene | µg/Kg | | ND(10) | ND(10) | ND(10) | 136 | 29.0 | ND(10) | ND(50) | 1259 |
| 1,2,4-Trimethylbenzene | µg/Kg | | 162 | 358 | ND(10) | 1023 | 218 | 395 | 149 | 9384 |
| sec-Butylbenzene | µg/Kg | | ND(10) | 65.0 | ND(10) | 74.0 | ND(10) | 76.0 | ND(50) | 326 |
| p-Isopropyltoluene | µg/Kg | | 35.0 | 254 | 43.0 | 139 | 28.0 | 300 | 107 | 544 |
| n-Butylbenzene | µg/Kg | | 54.0 | 180 | 41.0 | 248 | 13.0 | 159 | 225 | 306 |
| Napthalene | µg/Kg | 84,000 | ND(10) | 38.0 | ND(10) | 525 | 41.0 | 140 | ND(50) | 743 |
| **Semi-Volatile Organics** | | | | | | | | | | |
| 2-Methylnaphthalene | mg/Kg | | ND(19.6) | ND(24.8) | ND(19.9) | ND(20) | ND(19.8) | ND(19.8) | ND(19.9) | ND(19.9) |
| Diethyl phthalate | mg/Kg | 470 | ND(19.6) | ND(24.8) | ND(19.9) | ND(20) | ND(19.8) | ND(19.8) | ND(19.9) | ND(19.9) |
| Phenanthrene | mg/Kg | | ND(19.6) | 97.9 | ND(19.9) | ND(20) | ND(19.8) | ND(19.8) | ND(19.9) | ND(19.9) |
| Fluoranthene | mg/Kg | 3100 | 38.5 | 31.5 | ND(19.9) | ND(20) | ND(19.8) | ND(19.8) | ND(19.9) | ND(19.9) |
| Pyrene | mg/Kg | 2300 | ND(19.6) | 181 | ND(19.9) | ND(20) | ND(19.8) | ND(19.8) | ND(19.9) | ND(19.9) |
| Benzo(a)anthracene | mg/Kg | 0.8 | 58.1* | 51.8* | ND(19.9)* | ND(20)* | ND(19.8)* | 26.7* | ND(19.9)* | ND(19.9)* |
| Chrysene | mg/Kg | 88 | 97.4* | 64.6 | ND(19.9) | ND(20) | 27.2 | 39.1 | 30.1 | 27.7 |
| Benzo(a)pyrene | mg/Kg | | 21.3 | ND(24.8) | ND(19.9) | ND(20) | ND(19.8) | ND(19.8) | ND(19.9) | ND(19.9) |

' - Metals analyzed by EPA Method SW846.
' - Volatile organics analyzed by EPA Method 8260A.
' - Semi-volatile organcis analyzed by EPA Method 8270B.
TCLP - Toxic Characteristics Leachate Procedure

mg/Kg - Milligram per kilogram
µg/Kg - Microgram per kilogram
TACO - IEPA Tiered Approach to Cleanup Objectives Tier1, Table B Soil Cleanup Objective for Industrial/Commercial

0.05* - Compound exceeds TACO Tier 1 value
ND( ) - Not detected (detection limit)
ND( )* - Detection limit is above TACO Tier 1 value.

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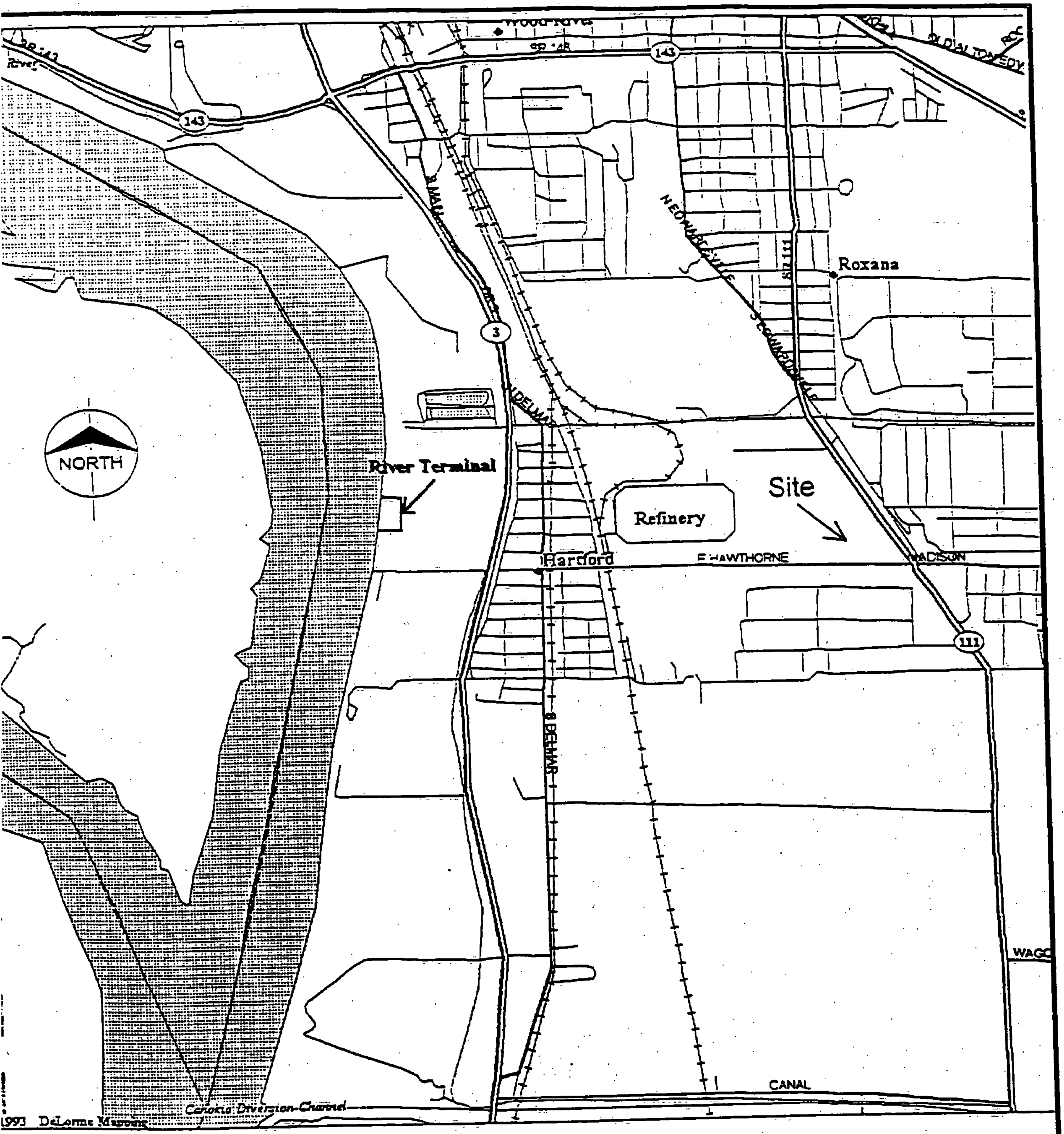



END

- State Route
- Town, Small City
- County Boundary
- Population Center
- Street, Road
- Hwy Ramp
- Major Street/Road
- State Route
- Railroad
- River
- Land Mass
- Open Water

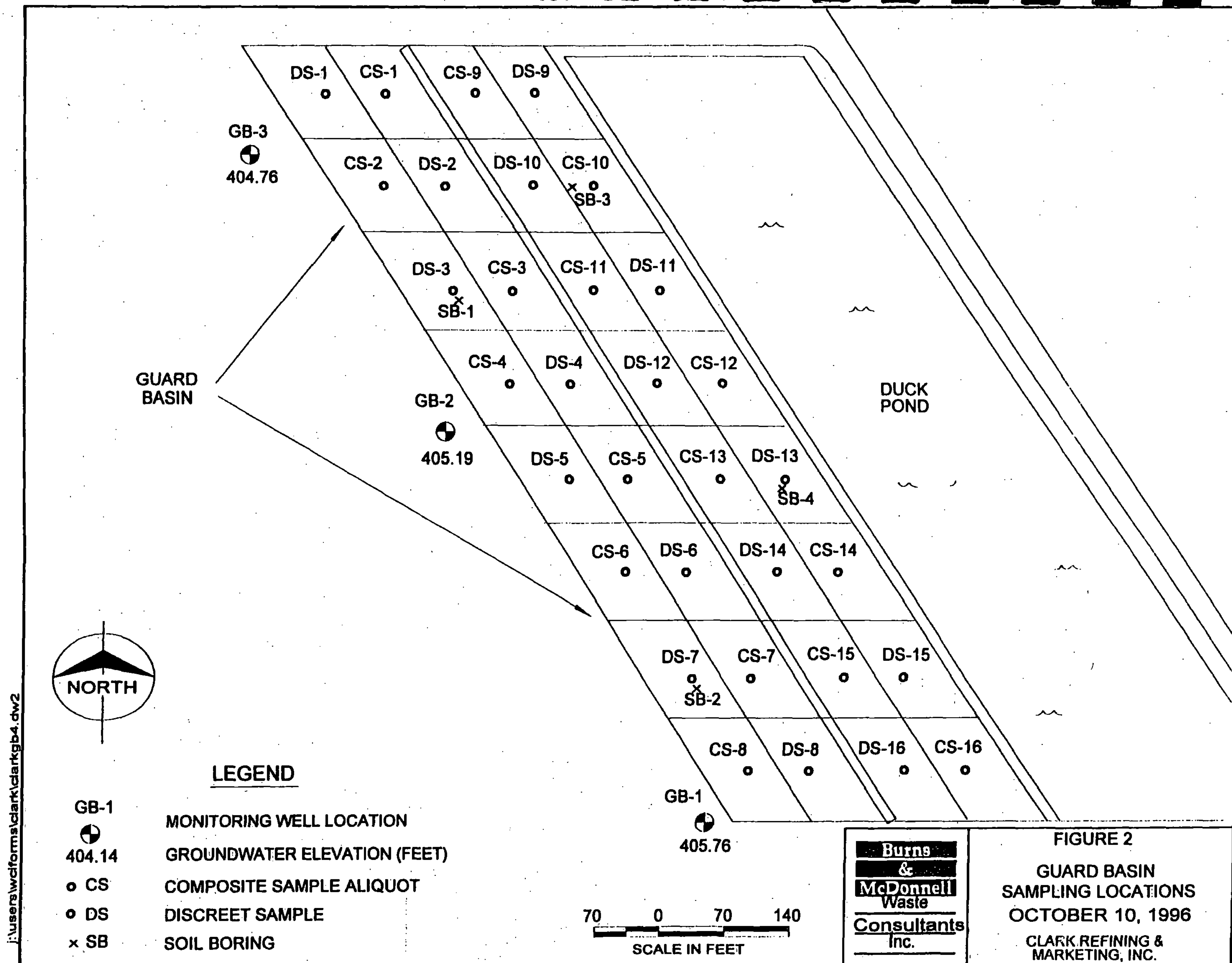
Scale 1:31,250 (at center)

2000 Feet

Burns & McDonnell Waste Consultants, Inc.

FIGURE 1

SITE LOCATION MAP
GUARD BASIN
CLARK REFINING &
MARKETING




Burns & McDonnell Waste Consultants Inc.

FIGURE 2

GUARD BASIN SAMPLING LOCATIONS

OCTOBER 10, 1996

CLARK REFINING & MARKETING, INC.

# APPENDIX A
Laboratory Reports and Chains-of-Custody

CLARK

REFINING & MARKETING, INC.

201 East Hawthorne
Hartford, Illinois 62048-0007
ph 618-254-7301 fx 618-254-6064

June 25, 1997

Mr. John Sherrill
Project Manager, State Sites Unit
Remedial Project Management Section
Division of Remediation Management
Bureau of Land
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62794

Re: 119050002--Madison County
Hartford/Clark Oil
Superfund/Techical Report

PCB No. 95-163
November, 1996 Partial Stipulation
and Proposal for Settlement

Dear Mr. Sherrill:

This letter is in response to your letter dated May 30, 1997, concerning the Illinois Environmental Protection Agency's (IEPA) review of the Burns & McDonnell Waste Consultants, Inc. (BMWCI) report "Site Investigation Report for the Guard Basin Area, Clark Refining & Marketing, Inc., Hartford, Illinois" dated December 1996 (Investigation Report). Clark Refining & Marketing, Inc. (Clark) would like to address the four comments made in the letter regarding the Investigation Report, as well as discuss other options for obtaining closure for the Guard Basin Area.

IEPA comments #1 and #2 address the elevated detection limits for some of the organic compounds analyzed for in the soil samples The detection limits were elevated due to necessary dilution of the samples due to relatively high concentrations of other hydrocarbon compound found within the samples. Please find attached a letter from the analytical laboratory explaining the elevated detection limits.

IEPA comment #3 addresses the repeated presence of benzene in monitoring well GB-5, as well as the presence of arsenic in monitoring wells GB-4, 5, and 6, and states that additional groundwater evaluation is warranted. Clark agrees with the IEPA's assessment that one additional year of groundwater sampling is warranted.

IEPA comment #4 proposes the installation of an additional groundwater monitoring well and quarterly groundwater sampling in GB-1, 4, 5, 6, and the new well. If contaminant concentrations do not significantly increase in these wells, the IEPA would consider the remediation requirements of the guard basin satisfied (with the possible use of an IEPA approved institutional control). Clark agrees with the IEPA that additional groundwater sampling is warranted in the Guard Basin area, but believes that continued semi-annual groundwater sampling of the existing wells (GB-1, 2, 3, 4, 5, 6) would assess any further groundwater impact due to the Guard Basin.

Monitoring wells GB-5 and GB-6 were installed in August 1993 as additional downgradient monitoring wells. Any impact to groundwater downgradient of the guard basin would be reflected by increased contaminant concentrations in these nearest downgradient wells (GB-4, 5 and 6). Clark and the IEPA agree that the purpose of continued monitoring in the guard basin area is to assess groundwater impact due to the guard basin; however, due to the industrial (petroleum refining) nature of the area, additional downgradient groundwater monitoring wells may be more representative of previous impacts by either Shell Oil or Clark. Contaminants further downgradient of the guard basin are currently being addressed by the groundwater remediation conducted by Shell, as evidenced by the change in groundwater flow (from the southwest to the northeast). Installation of additional monitoring wells would also offer direct pathways to the groundwater for possible future petroleum hydrocarbon releases.

If there are no significant increases in contaminant concentrations following one additional year of groundwater monitoring, Clark will assess the requirements for IEPA approved institutional controls to allow for complete site closure. Clark is committed to satisfying all the EPA requirements and has taken actions to minimize the risk of future contamination by installing devices and instituting procedures to insure the guard basin will be used for emergency stormwater retention only.

If you have any questions or comments regarding this letter or project, please contact me at (618) 254-7301 Extension 200.

Sincerely,

Forrest B. Lauher
Refinery Manager

Attachments

**TEKLAB, INC.**

5445 HORSESHOE LAKE ROAD
COLLINSVILLE, ILLINOIS 62234

ENVIRONMENTAL TESTING LABORATORY

TEL: 618-344-1004
FAX: 618-344-1005

Mr. Paul Christian
Burns & McDonnell Waste Consultants
17 Cassens Court
Fenton, MO 63026

June 6,1997

Re: Clark Oil Project

Mr. Christian,

This is in regard to detection limits reported by Teklab on samples analyzed for semi-volatile organic compounds (SW-846 Method 8270). The samples in question, DS-13 and DS-15, were soil samples delivered to Teklab on October 11, 1996 as part of a group collected at Clark Oil Refinery in Hartford, Illinois.

The normal procedure for preparing soil samples for analysis by gas chromatography / mass spectroscopy is to perform a solvent extraction using methylene chloride followed by a concentration step. On a typical soil, 30 grams of sample is extracted with three 100 milliliter aliquots of solvent, which is concentrated to 1 milliliter. This will result in detection limits ranging from 0.167 mg/kg to 1.67 mg/kg, depending on the particular compound. With most compounds this will be 0.333 mg/kg to 0.667mg/kg.

On many of the samples from the group in question, including DS-13 and DS-15, only 10 grams of sample were extracted, and due to the presence of very high concentrations of hydrocarbons could only be concentrated to 10 milliliters. Because of the presence of these hydrocarbons the sample was further diluted by a factor of 10. This was necessary to prevent contamination of the GC column or damage to the detector. The combination of the concentration step being 30 times higher than what is typical and the 10 fold dilution of the extract caused the detection limits to be elevated by a factor of 300.

We at Teklab will typically do as much as practical to achieve the lowest possible detection limits for our customers. In this case, the cost of a new column and the instrument down time had to be considered.

I hope that this answers your questions concerning these samples. If you need more information, please call at your convenience.

Tony A. Lynn
Laboratory Director

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director 2200 Churchill Road, Springfield, IL 62794-9276

(217) 785-5697

Rec'd 7/15/97

July 10, 1997

Forrest B. Lauher
Refinery Manager
Clark Refining and Marketing, Inc.
201 East Hawthorne
Hartford, Illinois 62048-0007

Re: 1190500002--Madison County
Hartford/Clark Oil
Superfund/Technical Report

PCB No. 95-163
November, 1996 Partial Stipulation
and Proposal for Settlement

Dear Mr. Lauher:

The Illinois Environmental Protection Agency (Illinois EPA) reviewed Clark's June 25, 1997 response to the Illinois EPA's May 30, 1997 letter regarding the "Site Investigation Report for the Guard Basin Area, Clark Refining and Marketing, Inc., Hartford, Illinois." The Illinois EPA concurs with Clark's responses. Below are the Illinois EPA's understanding of this matter:

Comments

1 & 2. The letter from the laboratory explains the elevated detection limits.

3 & 4. Additional groundwater monitoring will continue semi-annually for one year, utilizing monitoring wells GB-1,2,3,4,5,6. If the down gradient groundwater concentrations do not significantly increase over the reported 1994 through 1997 concentrations, then the Guard Basin groundwater considerations and requirements, pursuant to Section VII (C)(4)(c) and Section VII (C)(4)(c)(d), will be considered satisfied. Also, a groundwater use restriction by the use of an Illinois EPA-approved institutional control, may be warranted for the Guard Basin area. The evaluation and decision to use an institutional control can be made after the groundwater sampling events, during 1998.

And, the Guard Basin will be used for emergency stormwater retention only.

If you have any questions or comments regarding this correspondence please feel free to contact me.

Sincerely,

John Sherrill

John Sherrill
State Sites Unit
Remedial Project Management Section
Division of Remediation Management
Bureau of Land

** TX CONFIRMATION REPORT ** AS OF JUL 21 '97 08:22 PAGE.01

CLARK OIL

| | DATE | TIME | TO/FROM | MODE | MIN/SEC | PGS | CMD# | STATUS |
|---|---|---|---|---|---|---|---|---|
| 31 | 07/21 | 08:21 | 708 385 9370 | EC--S | 00'55" | 003 | 052 | OK |

FILE NUMBER 080.15 40 Guard Basin Cover EPA

RETAIN IN FILE UNTIL ____________

# CLARK REFINING & MARKETING, INC.

## Hartford Refinery

201 East Hawthorne Avenue
Hartford, Illinois 62048

Main Office: (618) 254-7301

Fax: (618) 254-6064

## FACSIMILE COVER PAGE

Send To / Company Name: Clark Blue Island

Attention: Bill Irwin Department: ____________

From: Steve Haug Department: ____________

Date: 7-21-97 Time: 8:15

Fax Number: 1-708-385-9370

Number of Pages: 3 (Including This Cover Page)

Comments: Sherrill ON for Guard Basin

VALUE DRIVEN

MARY E. BUETTNER, P.C.
*Attorney at Law*

November 24, 1998

Mr. John Sherrill
Bureau of Land
Illinois EPA
1021 N. Grand Avenue East
Springfield, Illinois 62794-9276

Re: Recorded Declaration of Restriction

Dear John:

As you requested, enclosed is a copy of the recorded declaration of restriction regarding Clark Refining & Marketing, Inc.'s guard basin.

Please contact me if you need anything else.

Sincerely,

Mary E. Buettner

[redacted]

836 NORTH MARKET STREET • WATERLOO, ILLINOIS 62298
(618) 939-6439

## DECLARATION OF RESTRICTION

Clark Refining & Marketing, Inc., a Delaware corporation, declares that the groundwater under a portion of its real estate, as described below and shown on the attached Exhibit A, shall not be used for human consumption. This restriction shall run with the land and may only be removed upon a demonstration that the aforesaid groundwater meets applicable Illinois residential groundwater quality standards or is otherwise fit for human consumption.

The above restriction shall apply to the groundwater under the following described real estate:

A tract of land in the Southeast Quarter of Section 34 and the Southwest Quarter of Section 35, all in Township 5 North, Range 9 West of the Third Principal Meridian, Madison County, Illinois, described as follows:

Commencing at the southwest corner of Section 35, Township 5 North, Range 9 West; thence North 01 degrees 22' 45" West, along the west line of said Section 35, a distance of 50.03 feet to the north right of way line of Hawthorne Street (100 feet wide), the POINT OF BEGINNING of the tract herein described; thence North 89 degrees 39' 48" West, along said right of way, a distance 1184.70 feet to an iron pin; thence North 18 degrees 03' 01" East a distance of 1550.40 feet to an iron pin; thence North 89 degrees 57' 11 " East a distance of 668.62 feet to the westerly right of way line of F.A.R. 132 (State Route 111), as shown in Road Record 7 Page 35 of Madison County Records; thence South 32 degrees 40' 22" East, along said right of way, a distance of 298.07 feet; thence continuing along said right of way around a curve to the left having a radius of 11559.60 feet, through a central angle of 2 degrees 27' 14", chord bearing South 33 degrees 53' 59" East, an arc distance of 495.07 feet; thence South 35 degrees 07' 35" East, continuing along said right of way, a distance of 912.61 feet to an iron pin; thence South 27 degrees 38' 33" West a distance of 91.52 feet to the north right of way of Hawthorne Street (100 feet wide); thence North 89 degrees 35' 20" West, along said right of way, a distance of 1047.63 feet to the point of beginning, containing 53.35 acres.

CLARK REFINING & MARKETING, INC.

By: [signature]

Title: Vice President

STATE OF MISSOURI )
) SS:
COUNTY OF ST. LOUIS )

4290 0247

The following Declaration of Restriction was acknowledged before me this 3rd day of November, 1998, by John Beinbom, known to me to be Vice President of Clark Refining & Marketing, Inc., a Delaware corporation, on behalf of said corporation, as the free and voluntary act of said corporation.

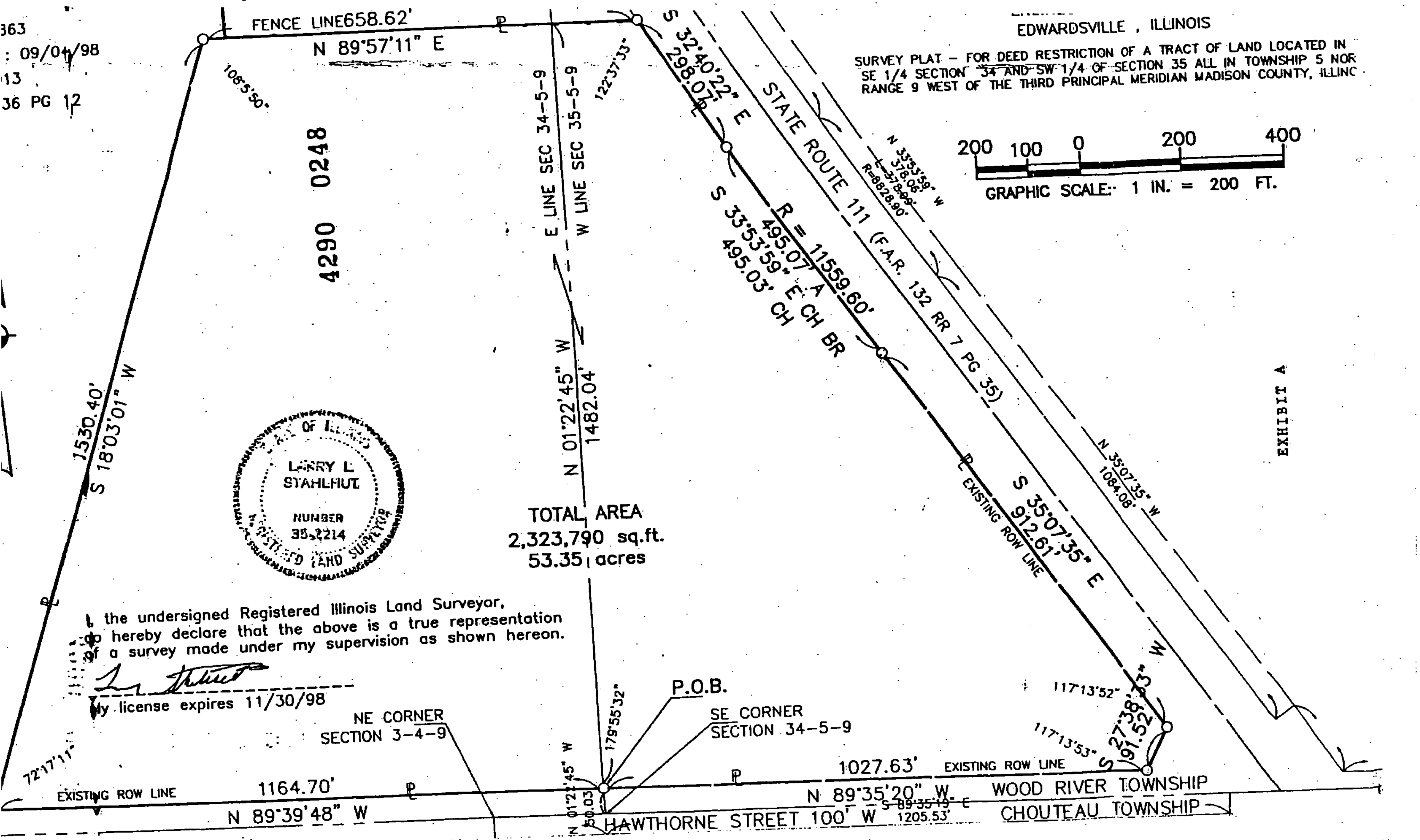
Deborah S. Hardesty
Notary Public

DEBORAH S. HARDESTY
NOTARY PUBLIC
NOTARY SEAL
STATE OF MISSOURI

Deborah S. Hardesty, Notary Public
St. Louis County, State of Missouri
My Commission Expires 5/6/2001

Return recorded document to preparer:

Legal Department
Clark Refining & Marketing, Inc.
8182 Maryland Avenue
St. Louis, MO 63105



363
: 09/04/98
13
36 PG 12
EDWARDSVILLE, ILLINOIS
SURVEY PLAT – FOR DEED RESTRICTION OF A TRACT OF LAND LOCATED IN SE 1/4 SECTION 34 AND SW 1/4 OF SECTION 35 ALL IN TOWNSHIP 5 NOR RANGE 9 WEST OF THE THIRD PRINCIPAL MERIDIAN MADISON COUNTY, ILLINC
200 100 0 200 400
GRAPHIC SCALE: 1 IN. = 200 FT.
FENCE LINE658.62'
N 89°57'11" E
108°5'50"
122°37'33"
4290 0248
E LINE SEC 34-5-9
W LINE SEC 35-5-9
S 32°40'22" E
298.07'
STATE ROUTE 111 (F.A.R. 132 RR 7 PG 35)
N 33°53'59" W
L=378.06'
R=8828.90'
R = 11559.60'
495.07' A
S 33°53'59" E CH BR
495.03' CH
N 01°22'45" W
1482.04'
1530.40'
S 18°03'01" W
N 35°07'35" W
1084.08'
S 35°07'35" E
912.61'
EXISTING ROW LINE
EXHIBIT A
STATE OF ILLINOIS
LARRY L STAHLHUT
NUMBER
35-2214
REGISTERED LAND SURVEYOR
TOTAL AREA
2,323,790 sq.ft.
53.35 acres
I the undersigned Registered Illinois Land Surveyor, do hereby declare that the above is a true representation of a survey made under my supervision as shown hereon.
My license expires 11/30/98
P.O.B.
179°55'32"
NE CORNER
SECTION 3-4-9
SE CORNER
SECTION 34-5-9
117°13'52"
117°13'53"
S 27°38'53" W
91.52'
72°17'11"
EXISTING ROW LINE
1164.70'
N 89°39'48" W
N 01°22'45" W
50.03'
1027.63'
EXISTING ROW LINE
N 89°35'20" W
S 89°35'19" E
1205.53'
HAWTHORNE STREET 100' W
WOOD RIVER TOWNSHIP
CHOUTEAU TOWNSHIP

4290 0249

STATE OF ILLINOIS
MADISON COUNTY
FILED FOR RECORD IN
THE RECORDERS OFFICE

98 NOV 13 PM 2:24

Daniel R Donohoo
RECORDER

End of Document

$27.00 pd ck # 13951

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 North Grand Avenue East, P.O. Box 19276, Springfield, Illinois 62794-9276 Mary A. Gade, Director

217-785-5697

December 7, 1998

Steve Haug
Environmental Specialist
Clark Refining & Marketing, Inc
201 East Hawthorne
Hartford, Illinois 62048-0007

Re: 1190500002-Madison County
Hartford/Clark Oil
Superfund/Technical Report

Dear Mr. Haug,

The Illinois Environmental Protection Agency (Illinois EPA) received the November 24, 1998 letter from Clark's attorney, Mary E. Buettner. Enclosed with her letter was a copy of the recorded declaration of the groundwater use restriction for 53.35 acres of the area in and around the Guard Basin. The groundwater contaminants of concern are arsenic and benzene.

Part or all of the source of the groundwater contamination is from the refinery's storm water management system that historically emptied into the Guard Basin. From 8/30/93 through 1/94, Clark removed approximately 50,000 $yds^3$ of sludge from the Guard Basin. Since 1994, Clark has collected groundwater samples from six groundwater monitoring wells located around the Guard Basin. During the April 23, 1998 groundwater monitoring event, arsenic concentrations from GB-4, GB-5, and GB-6 were in excess of the Class I arsenic groundwater objective of 0.05 mg/L; with concentrations of 0.123 mg/L, 0.103 mg/L and 0.234 mg/L, respectively. Monitoring wells GB-4 and GB-6 were in excess of the Class I benzene objective of 0.005 ug/L; with concentrations of 7.4 ug/L and 11.1 ug/L, respectively. The six years of sampling results demonstrate that groundwater contaminant concentrations are decreasing. No further sampling is required. With the groundwater use restriction, Clark has met its Guard Basin requirements.

This letter signifies that Clark has satisfactorily met its obligations in regards to the Guard Basin as referenced in the Opinion and Order of the Pollution Control Board (PCB 95-163), dated January 23, 1997, and Section VII.C.4.d. of the Partial Stipulation and Proposal for Settlement.

If you have any questions regarding this correspondence please feel free to contact me.

Sincerely,

John Sherrill

John Sherrill
State Sites Unit
Remedial Project Management Section
Bureau of Land

STATE OF MISSOURI )
) SS:
COUNTY OF ST. LOUIS )

The following Declaration of Restriction was acknowledged before me this _____ day of ____________________, 1998, by ________________________, known to me to be ____________________ of Clark Refining & Marketing, Inc., a Delaware corporation, on behalf of said corporation, as the free and voluntary act of said corporation.

______________________________
Notary Public

Return recorded document to preparer:

Legal Department
Clark Refining & Marketing, Inc.
8182 Maryland Avenue
St. Louis, MO 63105

APPENDIX S

# APPENDIX S

APPENDIX T

APPENDIX T

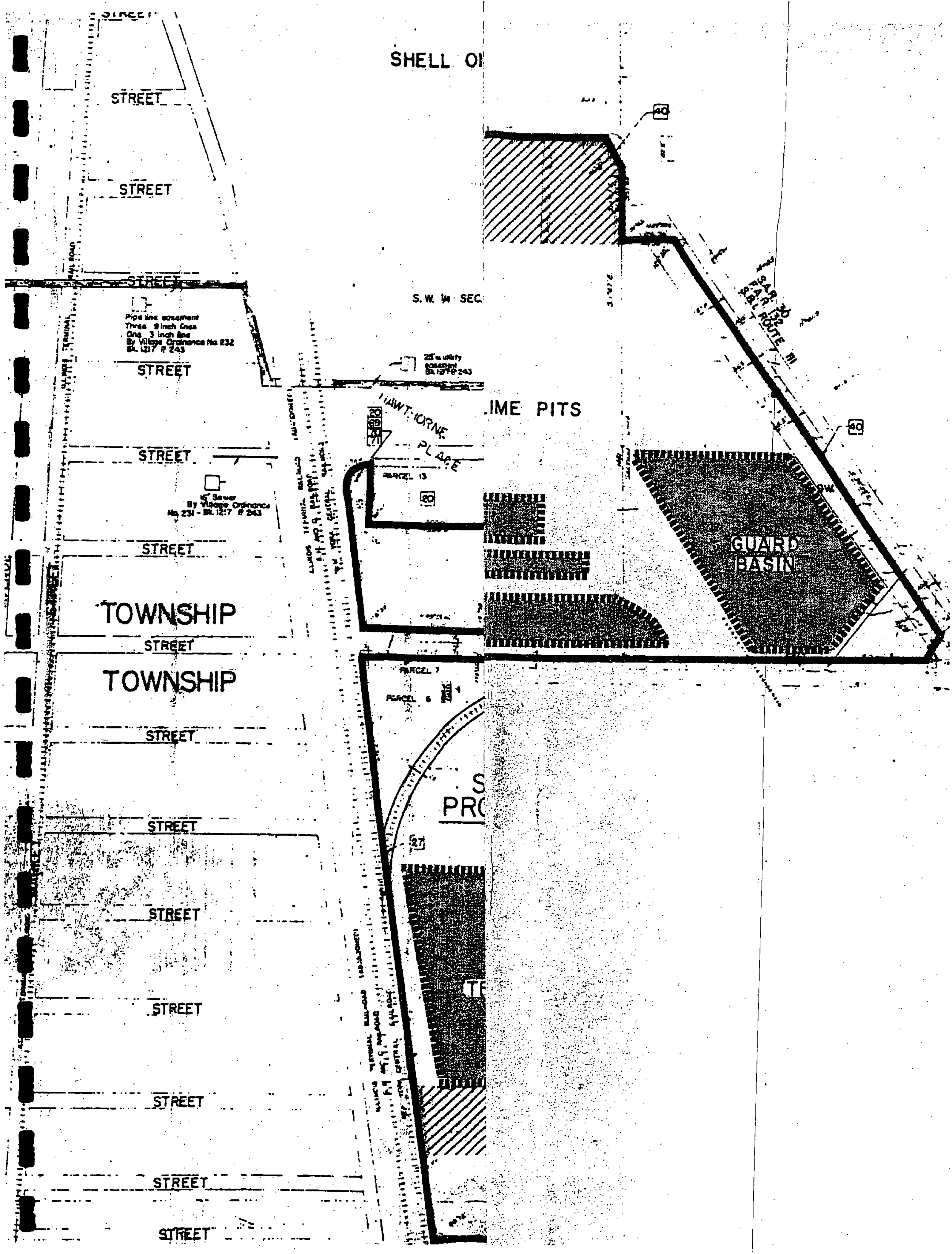
Clayton GROUP SERVICES

# APPENDIX T

## DOCUMENTS RELATED TO THE LAYDOWN AREA

# APPENDIX T-1

## FIGURE
## DAMES AND MOORE REPORT
## OCTOBER 31, 1980



STREET
SHELL OI
STREET
STREET
STREET
S.W. 1/4 SEC
Pipe line easement
Three 8 inch lines
One 3 inch line
By Village Ordinance No 232
Bk 1217 P 243
STREET
25' utility easement
Bk 1217 P 243
HAWTHORNE PLACE
LIME PITS
STREET
PARCEL 13
15" Sewer
By Village Ordinance
No 231 - Bk 1217 P 243
STREET
GUARD BASIN
TOWNSHIP
STREET
TOWNSHIP
PARCEL 7
PARCEL 6
STREET
PRO
STREET
STREET
STREET
STREET
STREET
STREET

Clayton
GROUP SERVICES

# APPENDIX T-2

## CLARK LETTER
## OCTOBER 20, 1983

Mailed 11-20-83

CLARK®

Clark Oil & Refining Corporation
Woodriver Refinery
P.O. Box 7
Hartford, Illinois 62048
618-254-7301

October 20, 1983

Illinois EPA
117 W. Main Street
Collinsville, IL 62234
Attn: Mr. Kenneth G. Mensing, Southern Region Manager
Land Field Operations Section
Division of Land Pollution Control

Dear Mr. Mensing:

As requested by you in your letter of October 6, 1983, I am forwarding a diagram showing the areas requested, and points indicating where samples were taken. Also included are results of the tests run on these samples. We feel the samples are representative. If you have any other questions contact Mr. Knipping or the writer.

Yours very ~~truly~~,

Clark Oil & Refining Corporation

S. L. Van Petten

S. L. Van Petten
Manager, Construction & Services

SLVP:csh

Enclosures

## Sample Collection

The points marked in red are points at which samples were taken. In area four, storm water surface water impoundment, the samples were taken downstream from the point of entry into the basin. Since area four had been dredged, it was felt that samples from these points were representative of the bottom composition.

Area eleven, guard basin sludge impoundment, was sampled using a small scoop, sampling at various depths, and then mixing the sample thoroughly before delivery to the laboratory.

Area thirteen, crude tank bottoms impoundment area, was sampled using a cup with a seven foot handle. Both surface and sub-surface samples were taken, and well mixed before delivery to the laboratory.

The water sample from the storm water surface water impoundment was taken from a line just prior to entry into the dissolved air floatation unit in our water pretreatment area. In this case, it was felt that pump and line turbulence gave us a well mixed representative sample.

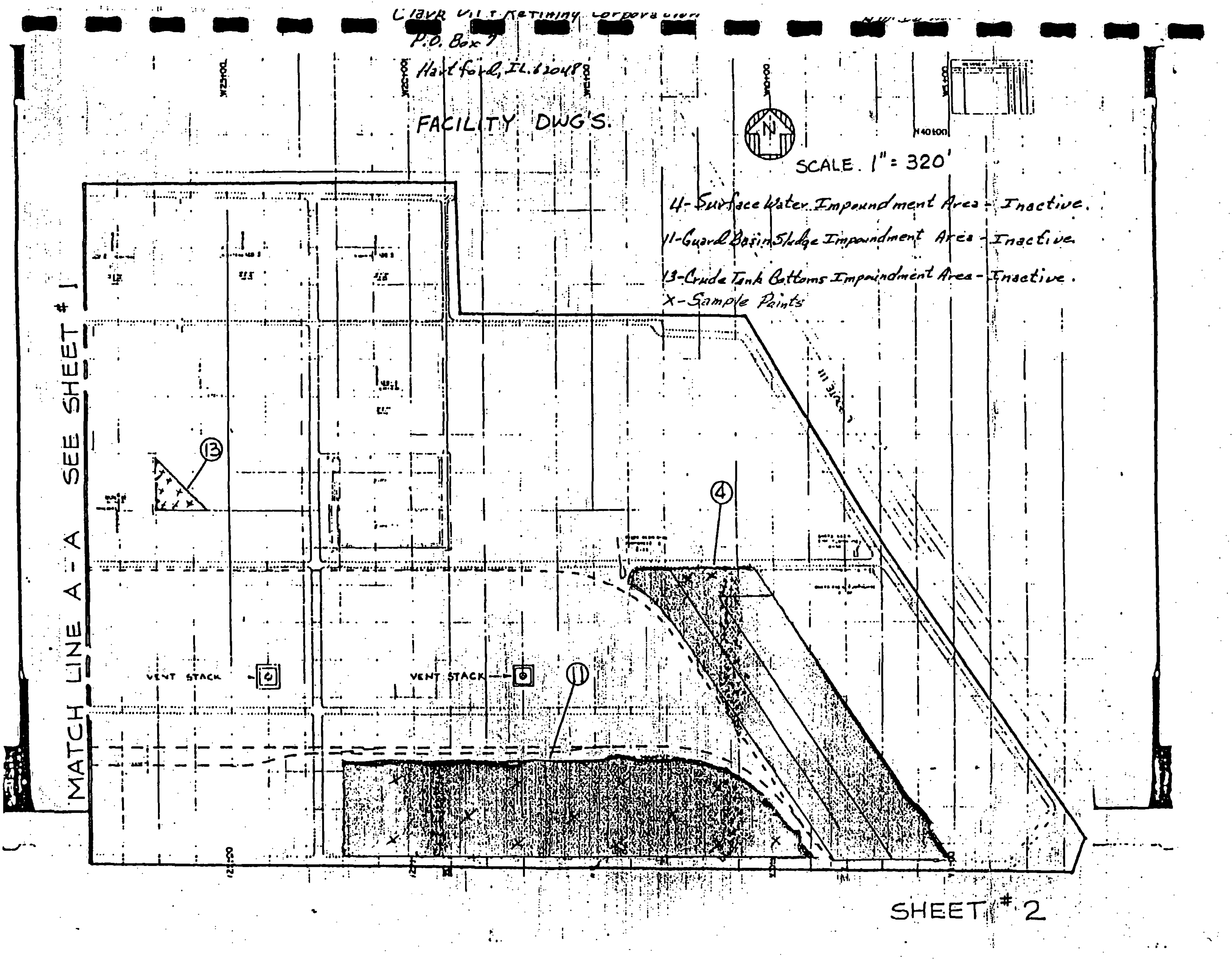
The analyses for hazardous waste constituents are included.

Report of Analysis

| Sample Name | Bottom Sludge Storm Water Surface Water Impoundment Area | | Guard Basin Sludge Impoundment | Crude Tank Bott Impound. |
|---|---|---|---|---|
| Date Sampled | 4-28-82 | 11-13-81 | 3-30-82 | 10-11-83 |
| Ignitability, Method 261.21 | | | | |
| Flash Pt. (P-M)$^{o}$ F. | >210 | >210 | >210 | >210 |
| Corrosivity, Method 261.22 | | | | |
| pH Value 10% Sol'n. | 7.86 | 7.46 | 7.37 | 6.74 |
| Reactivity, Method 261.23 | | | | |
| Cyanide (Total) ug/g | 0.25 | <1.0 | 7.6 | <.06 |
| Cyanide (Reactive) ug/g | 0.15 | 0.2 | 6.8 | <.06 |
| Sulfides (Total) ug/g | 1000 | 320 | 20.0 | 246 |
| Sulfides (Reactive) ug/g | 260 | <0.2 | 20.0 | 72 |
| EP. Toxicity, Method 261.24 | | | | |
| Arsenic Mg/l | .004 | .003 | <.001 | .0C |
| Barium Mg/l | 2.69 | 0.74 | 0.54 | .04 |
| Cadmium Mg/l | <.001 | <.001 | <.001 | .0C |
| Chromium, Total Mg/l | 0.447 | .025 | 1.36 | .0C |
| Chromium, Hexavalent Mg/l | <.005 | <.025 | <.005 | <.0C |
| Lead Mg/l | 0.19 | .01 | 0.24 | <.01 |
| Mercury Mg/l | <.005 | <.0005 | <.005 | <.0C |
| Selenium Mg/l | .005 | .001 | <.001 | <.01 |
| Silver Mg/l | .014 | .010 | .019 | <.0C |

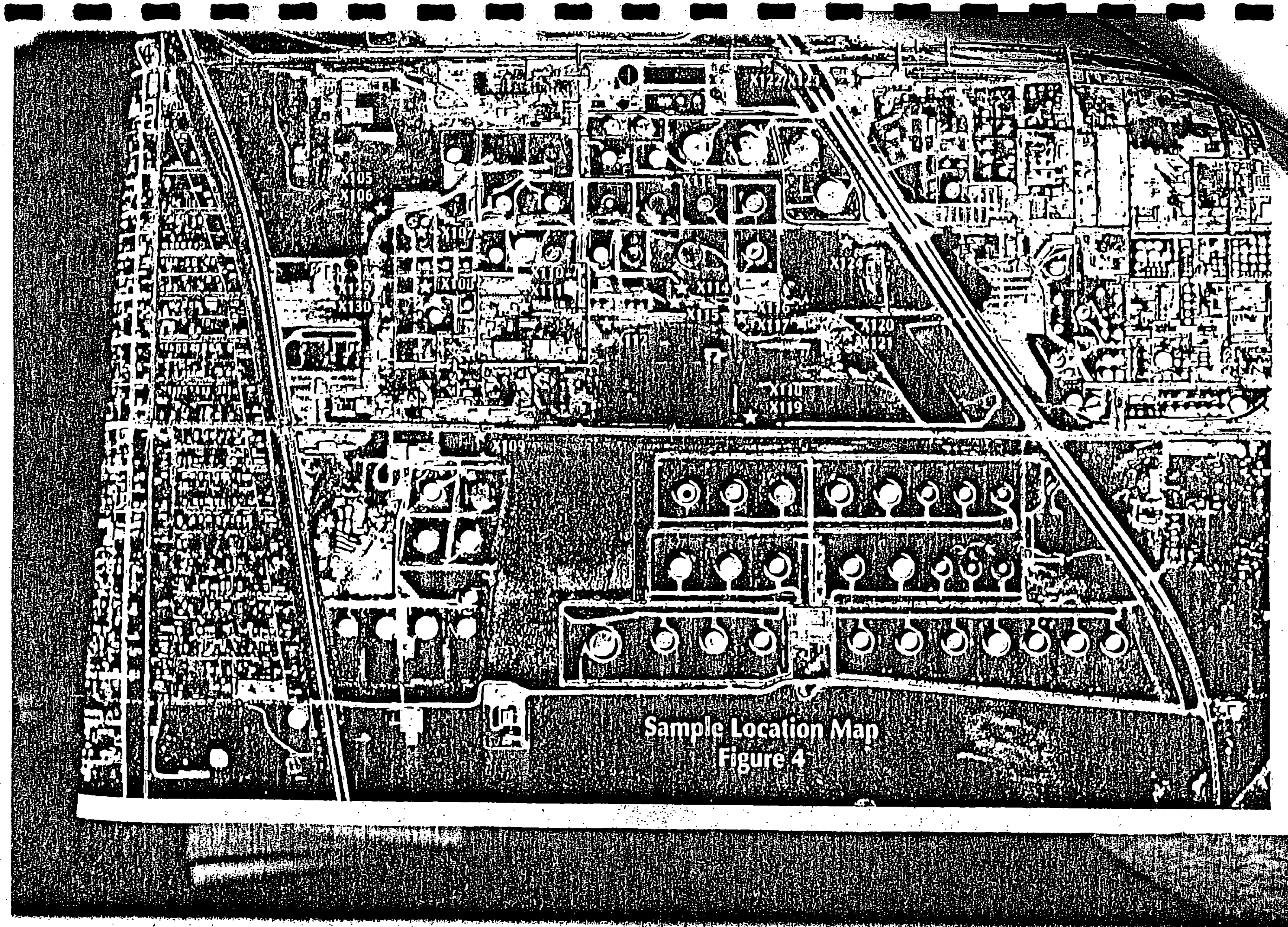
Report of Analysis

| | |
|---|---|
| Sample Name | Water from Storm Water, Surface Water Impoundment Area |
| Date Sampled | 10-11-83 |
| Ignitability, Method 261.21 | |
| Flash Pt. (P-M)° F. | >210 |
| Corrosivity, Method 261.22 | |
| pH Value | 7.43 |
| Reactivity, Method 261.23 | |
| Cyanide, Total Mg/l | .035 |
| Cyanide, Reactive Mg/l | <.01 |
| Sulfides, Total Mg/l | 2.6 |
| Sulfides, Reactive Mg/l | 0.9 |
| EP. Toxicity, Method 261.24 | |
| Arsenic Mg/l | .005 |
| Barium Mg/l | .13 |
| Cadmium Mg/l | .007 |
| Chromium, Total Mg/l | .072 |
| Chromium, Hexavalent Mg/l | .010 |
| Lead Mg/l | .06 |
| Mercury Mg/l | <.002 |
| Selenium Mg/l | .062 |
| Silver Mg/l | .011 |


Clark Oil & Refining Corporation
P.O. Box 7
Hartford, IL. 62048
FACILITY DWG'S.
N
SCALE 1" = 320'
4- Surface Water Impoundment Area - Inactive.
11-Guard Basin Sludge Impoundment Area - Inactive.
13-Crude Tank Bottoms Impoundment Area - Inactive.
X-Sample Points
MATCH LINE A-A SEE SHEET # 1
13
4
11
VENT STACK
VENT STACK
SHEET # 2

# APPENDIX T-3

## CERCLA EXPANDED SITE INSPECTION
## NOVEMBER 2000




Sample Location Map
Figure 4

## CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

### TABLE 4



Analytical Results (Qualified Data)

| | |
|---|---|
| Case #: 28678 | SDG : MEE01B |
| Site : | CLARK OIL |
| Lab. : | LIBRTY |
| Reviewer : | J. GANZ |
| Date : | DECEMBER 12, 2000 |

| Sample Number : | MEE01M | | MEE01N | | MEE01P | | MEE01Q | | MEE01R | | MEE01S | | MEE01T | | MEE01W | | MEE01X | | MEE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | | mg/Kg | |
| Date Sampled : | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | | 11/2/00 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Solids : | 81.3 | | 62.4 | | 74.2 | | 80.2 | | 73.9 | | 79.4 | | 78.4 | | 78.5 | | 75.1 | | 76.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| ANALYTE | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Fl |
| ALUMINUM | 6840 | | 952 | | 11800 | | 193 | | 15100 | | 9460 | | 24600 | | 448 | | 11000 | | 8240 | |
| ANTIMONY | 0.53 | UJ | 26.5 | J | 0.71 | J | 0.57 | UJ | 0.65 | J | 0.64 | J | 1.2 | J | 0.83 | J | 0.57 | UJ | 1.0 | J |
| ARSENIC | 5.9 | J | 2.4 | J | 3.7 | J | 1.0 | J | 5.2 | J | 5.4 | J | 14.2 | J | 2.0 | J | 6.1 | J | 9.1 | J |
| BARIUM | 164 | | 34.4 | | 842 | | 66.0 | | 247 | | 238 | | 197 | | 14.6 | | 317 | | 155 | |
| BERYLLIUM | 0.43 | | 0.10 | J | 0.77 | | 0.049 | U | 1.0 | | 0.64 | | 0.76 | | 0.049 | U | 0.63 | | 0.46 | |
| CADMIUM | 0.070 | U | 26.8 | | 0.17 | J | 0.074 | U | 0.080 | U | 0.10 | J | 0.076 | U | 0.074 | U | 0.074 | U | 0.079 | U |
| CALCIUM | 2950 | J | 11100 | J | 4120 | J | 3150 | J | 5580 | J | 23300 | J | 17600 | J | 7600 | J | 3680 | J | 15900 | J |
| CHROMIUM | 11.3 | J | 196 | J | 14.1 | J | 5.0 | J | 16.6 | J | 126 | J | 127 | J | 24.2 | J | 16.7 | J | 76.6 | J |
| COBALT | 6.1 | | 2.8 | | 37.0 | | 0.96 | | 9.0 | | 9.1 | | 8.9 | | 1.8 | | 6.5 | | 32.0 | |
| COPPER | 14.7 | | 333 | | 21.8 | | 12.4 | | 26.0 | | 28.1 | | 39.9 | | 18.1 | | 19.8 | | 57.5 | |
| IRON | 13500 | | 4670 | | 13900 | | 1430 | | 20300 | | 16000 | | 16800 | | 26500 | | 17800 | | 19800 | |
| LEAD | 9.0 | J | 172 | J | 17.6 | J | 22.2 | J | 12.6 | J | 39.3 | J | 88.8 | J | 7.7 | J | 13.4 | J | 84.1 | J |
| MAGNESIUM | 2920 | | 2410 | | 3420 | | 868 | | 3830 | | 3900 | | 8100 | | 875 | | 3720 | | 3160 | |
| MANGANESE | 229 | J | 74.3 | J | 3900 | J | 22.7 | J | 599 | J | 583 | J | 544 | J | 113 | J | 436 | J | 316 | J |
| MERCURY | 0.098 | J | 0.37 | J | 0.073 | J | 0.081 | J | 0.069 | J | 0.11 | J | 0.13 | J | 0.092 | J | 0.11 | J | 0.21 | J |
| NICKEL | 18.8 | J | 70.2 | J | 29.9 | J | 3.1 | J | 21.9 | J | 24.7 | J | 26.4 | J | 24.9 | J | 20.8 | J | 65.4 | J |
| POTASSIUM | 784 | | 120 | | 993 | | 42.2 | | 1290 | | 1180 | | 1490 | | 95.5 | | 1250 | | 874 | |
| SELENIUM | 1.0 | UJ | 3.0 | J | 1.1 | UJ | 1.1 | UJ | 1.2 | UJ | 2.6 | J | 1.5 | J | 9.6 | J | 1.1 | UJ | 1.7 | J |
| SILVER | 0.093 | U | 1.0 | | 0.11 | U | 0.18 | | 0.11 | U | 0.099 | U | 0.10 | U | 0.16 | | 0.099 | U | 0.10 | U |
| SODIUM | 262 | J | 298 | J | 1040 | J | 224 | J | 260 | J | 268 | J | 349 | J | 246 | J | 328 | J | 494 | J |
| THALLIUM | 7.8 | J | 3.1 | J | 7.0 | J | 1.4 | UJ | 9.9 | J | 7.7 | J | 7.1 | J | 14.9 | J | 10.3 | J | 11.6 | J |
| VANADIUM | 19.2 | | 403 | | 23.4 | | 5.3 | | 29.5 | | 63.6 | | 70.1 | | 334 | | 27.5 | | 53.5 | |
| ZINC | 44.2 | U | 2480 | J | 44.5 | J | 39.1 | J | 55.0 | J | 139 | J | 217 | J | 33.8 | J | 62.2 | J | 95.9 | J |
| CYANIDE | 0.055 | U | 0.64 | | 0.082 | J | 0.49 | | 0.076 | J | 0.39 | J | 0.41 | J | 2.8 | | 0.059 | U | 3.5 | |

CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

TABLE 3

| Analytical Results (Qualified Data) | | Page 2 |
|---|---|---|
| Case #: 28678 | SDG : EE01K | |
| Site : | CLARK OIL | |
| Lab. : | LIBRTY | |
| Reviewer : | | |
| Date : | | |

| Sample Number : | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | |
| %Moisture : | 16 | | 29 | | 29 | | 4 | | 26 | |
| pH : | 7.9 | | 7.9 | | 7.6 | | 7.4 | | 7.1 | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 2.0 | | 1.0 | |
| **Pesticide/PCB Compound** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| alpha-BHC | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U |
| beta-BHC | 2.0 | U | 610 | J | 2.4 | U | 3.5 | U | 2.3 | U |
| delta-BHC | 2.0 | U | 190 | J | 2.4 | U | 4.6 | J | 2.3 | U |
| gamma-BHC (Lindane) | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U |
| Heptachlor | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U |
| Aldrin | 2.0 | U | 100 | J | 2.4 | U | 3.5 | U | 2.3 | U |
| Heptachlor epoxide | 2.0 | U | 2.4 | U | 2.4 | U | 1.7 | J | 2.3 | U |
| Endosulfan I | 2.0 | U | 2.4 | U | 2.4 | U | 3.5 | U | 2.3 | U |
| Dieldrin | 3.9 | U | 15 | J | 4.7 | U | 36 | J | 4.5 | U |
| 4,4'-DDE | 3.9 | U | 4.7 | U | 4.7 | U | 6.5 | J | 4.5 | U |
| Endrin | 3.9 | U | 23 | J | 4.7 | U | 5.2 | J | 4.5 | U |
| Endosulfan II | 3.9 | U | 6.8 | J | 4.7 | U | 4.0 | J | 4.5 | U |
| 4,4'-DDD | 3.9 | U | 19 | J | 4.7 | U | 6.9 | U | 4.5 | U |
| Endosulfan sulfate | 3.9 | U | 4.7 | U | 4.7 | U | 6.9 | U | 4.5 | U |
| 4,4'-DDT | 3.9 | U | 20 | J | 4.7 | U | 6.9 | U | 4.5 | U |
| Methoxychlor | 20 | U | 24 | U | 24 | U | 35 | U | 23 | U |
| Endrin ketone | 3.9 | U | 9.8 | J | 4.7 | U | 140 | J | 4.5 | U |
| Endrin aldehyde | 3.9 | U | 4.7 | U | 4.7 | U | 86 | J | 4.5 | U |
| alpha-Chlordane | 2.0 | U | 59 | J | 2.4 | U | 40 | J | 2.3 | U |
| gamma-Chlordane | 2.0 | U | 41 | J | 2.4 | U | 1.8 | J | 2.3 | U |
| Toxaphene | 200 | U | 240 | U | 240 | U | 350 | U | 230 | U |
| Aroclor-1016 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U |
| Aroclor-1221 | 80 | U | 94 | U | 94 | U | 140 | U | 91 | U |
| Aroclor-1232 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U |
| Aroclor-1242 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U |
| Aroclor-1248 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U |
| Aroclor-1254 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U |
| Aroclor-1260 | 39 | U | 46 | U | 46 | U | 69 | U | 45 | U |

| Sample Number : | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture : | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH : | 7.6 | | 6.9 | | 8.0 | | 8.4 | | 8.3 | |
| Dilution Factor : | 1.0 | | 1.0 | | 2.0 | | 1.0 | | 2.0 | |
| **Pesticide/PCB Compound** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| alpha-BHC | 2.1 | U | 2.1 | U | 67 | J | 2.2 | U | 0.87 | J |
| beta-BHC | 12 | J | 14 | J | 4.2 | R | 2.4 | J | 18 | |
| delta-BHC | 2.1 | U | 2.1 | U | 4.2 | R | 2.2 | U | 3.5 | U |
| gamma-BHC (Lindane) | 2.1 | U | 2.1 | U | 4.2 | R | 0.77 | J | 3.1 | J |
| Heptachlor | 2.1 | U | 2.1 | U | 140 | J | 2.2 | U | 3.5 | U |
| Aldrin | 3.8 | J | 4.6 | J | 20 | J | 1.2 | J | 15 | J |
| Heptachlor epoxide | 6.1 | J | 11 | J | 20 | J | 2.2 | U | 29 | J |
| Endosulfan I | 2.1 | U | 2.1 | U | 8.0 | J | 2.2 | U | 3.5 | U |
| Dieldrin | 12 | J | 17 | J | 40 | J | 4.2 | U | 58 | J |
| 4,4'-DDE | 4.0 | U | 4.1 | U | 69 | J | 4.2 | U | 130 | J |
| Endrin | 23 | J | 12 | J | 50 | J | 3.5 | J | 110 | J |
| Endosulfan II | 4.0 | U | 4.1 | U | 8.1 | R | 4.2 | U | 6.9 | U |
| 4,4'-DDD | 10 | J | 14 | J | 17 | J | 1.6 | J | 13 | J |
| Endosulfan sulfate | 13 | J | 18 | J | 8.1 | R | 4.2 | U | 66 | J |
| 4,4'-DDT | 34 | J | 47 | J | 42 | J | 4.2 | U | 6.9 | U |
| Methoxychlor | 21 | U | 21 | U | 41 | R | 22 | U | 35 | U |
| Endrin ketone | 6.2 | J | 9.6 | J | 46 | J | 4.2 | U | 150 | J |
| Endrin aldehyde | 22 | J | 32 | J | 8.1 | R | 1.8 | J | 52 | J |
| alpha-Chlordane | 6.0 | J | 9.7 | J | 4.2 | R | 2.2 | U | 150 | J |
| gamma-Chlordane | 6.2 | J | 9.9 | J | 28 | J | 2.2 | U | 520 | |
| Toxaphene | 210 | U | 210 | U | 410 | R | 220 | U | 350 | U |
| Aroclor-1016 | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1221 | 82 | U | 83 | U | 160 | R | 86 | U | 140 | U |
| Aroclor-1232 | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1242 | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1248 | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1254 | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |
| Aroclor-1260 | 40 | U | 41 | U | 80 | R | 42 | U | 69 | U |

CLARK OIL & REFINING COMPANY
HARTFORD, ILLINOIS

TABLE 2

Results (Qualified Data)

Page 2

SDG : EE01K
CLARK OIL
LIBRTY

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | |
| Sampling Location | X111 | | X112 | | X113 | | X114 | | X115 | |
| Matrix | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | |
| %Moisture | 18 | | 29 | | 29 | | 4 | | 26 | |
| pH | 7.9 | | 7.9 | | 7.6 | | 7.4 | | 7.1 | |
| Dilution Factor | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| Semivolatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| Benzaldehyde | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Phenol | 390 | U | 80000 | J | 460 | U | 31000 | U | 450 | U |
| bis-(2-Chloroethyl) ether | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2-Chlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2-Methylphenol | 390 | U | 2300 | J | 460 | U | 31000 | U | 450 | U |
| 2,2'-oxybis(1-Chloropropane) | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Acetophenone | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 4-Methylphenol | 390 | U | 30000 | | 460 | U | 31000 | U | 450 | U |
| N-Nitroso-di-n-propylamine | 390 | U | 14000 | UJ | 460 | U | 31000 | U | 450 | U |
| Hexachloroethane | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Nitrobenzene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U |
| Isophorone | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2-Nitrophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2,4-Dimethylphenol | 390 | U | 2900 | J | 460 | U | 31000 | U | 450 | U |
| bis(2-Chloroethoxy)methane | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2,4-Dichlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Naphthalene | 390 | U | 21000 | | 460 | U | 31000 | U | 450 | U |
| 4-Chloroaniline | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Hexachlorobutadiene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U |
| Caprolactam | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 4-Chloro-3-methylphenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2-Methylnaphthalene | 390 | U | 94000 | | 460 | U | 7000 | J | 50 | J |
| Hexachlorocyclopentadiene | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U |
| 2,4,6-Trichlorophenol | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2,4,5-Trichlorophenol | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U |
| 1,1'-Biphenyl | 390 | U | 5500 | J | 460 | U | 31000 | U | 450 | U |
| 2-Chloronaphthalene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U |
| Dimethylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2,6-Dinitrotoluene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Acenaphthylene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 3-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U |
| Acenaphthene | 390 | U | 6500 | J | 460 | U | 31000 | U | 450 | U |
| 2,4-Dinitrophenol | 990 | U | 35000 | U | 1200 | U | 78000 | UJ | 1100 | U |
| 4-Nitrophenol | 990 | U | 35000 | U | 1200 | U | 78000 | UJ | 1100 | U |
| Dibenzofuran | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 2,4-Dinitrotoluene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Diethylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Fluorene | 390 | U | 10000 | J | 460 | U | 5500 | J | 450 | U |
| 4-Chlorophenyl-phenyl ether | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U |
| 4-Nitroaniline | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | UJ |
| 4,6-Dinitro-2-methylphenol | 990 | U | 35000 | U | 1200 | U | 78000 | U | 1100 | U |
| N-Nitrosodiphenylamine | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 4-Bromophenyl-phenylether | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Hexachlorobenzene | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Atrazine | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Pentachlorophenol | 990 | U | 35000 | R | 1200 | U | 78000 | U | 1100 | U |
| Phenanthrene | 390 | U | 24000 | | 460 | U | 29000 | J | 450 | U |
| Anthracene | 390 | U | 5300 | J | 460 | U | 31000 | U | 450 | U |
| Carbazole | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | UJ |
| Di-n-butylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Fluoranthene | 390 | U | 3200 | J | 460 | U | 31000 | U | 450 | U |
| Pyrene | 390 | U | 13000 | J | 460 | U | 150000 | | 450 | U |
| Butylbenzylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| 3,3'-Dichlorobenzidine | 390 | U | 14000 | U | 460 | U | 31000 | UJ | 450 | U |
| Benzo(a)anthracene | 390 | U | 7000 | J | 460 | U | 60000 | | 450 | U |
| Chrysene | 390 | U | 9800 | J | 460 | U | 120000 | | 450 | U |
| bis(2-Ethylhexyl)phthalate | 390 | U | 11000 | J | 460 | U | 31000 | U | 450 | U |
| Di-n-octylphthalate | 390 | U | 14000 | U | 460 | U | 31000 | U | 450 | U |
| Benzo(b)fluoranthene | 390 | U | 2800 | J | 460 | U | 16000 | J | 450 | U |
| Benzo(k)fluoranthene | 390 | U | 2900 | J | 460 | U | 31000 | UJ | 450 | U |
| Benzo(a)pyrene | 390 | U | 5700 | J | 460 | U | 31000 | | 450 | U |
| Indeno(1,2,3-cd)pyrene | 390 | U | 2000 | J | 460 | U | 7500 | J | 450 | U |
| Dibenzo(a,h)anthracene | 390 | U | 3000 | J | 460 | U | 8400 | J | 450 | U |
| Benzo(g,h,i)perylene | 390 | U | 3100 | J | 460 | U | 18000 | J | 450 | U |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Number | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
| Sampling Location | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH | 7.6 | | 6.9 | | 8.0 | | 8.4 | | 8.3 | |
| Dilution Factor | 1.0 | | 2.0 | | 1.0 | | 1.0 | | 1.0 | |
| Semivolatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| Benzaldehyde | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Phenol | 2000 | | 450 | J | 130000 | | 420 | U | 84 | J |
| bis-(2-Chloroethyl) ether | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Chlorophenol | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Methylphenol | 800 | | 260 | J | 4100 | J | 420 | U | 52 | J |
| 2,2'-oxybis(1-Chloropropane) | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Acetophenone | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Methylphenol | 1600 | | 460 | J | 51000 | | 46 | J | 120 | J |
| N-Nitroso-di-n-propylamine | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Hexachloroethane | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Nitrobenzene | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Isophorone | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Nitrophenol | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,4-Dimethylphenol | 380 | J | 130 | J | 12000 | U | 420 | U | 340 | U |
| bis(2-Chloroethoxy)methane | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,4-Dichlorophenol | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Naphthalene | 2200 | | 960 | | 19000 | | 420 | U | 450 | |
| 4-Chloroaniline | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Hexachlorobutadiene | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Caprolactam | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Chloro-3-methylphenol | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Methylnaphthalene | 10000 | | 2800 | | 100000 | | 89 | J | 1900 | |
| Hexachlorocyclopentadiene | 400 | U | 810 | UJ | 12000 | U | 420 | U | 340 | U |
| 2,4,6-Trichlorophenol | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,4,5-Trichlorophenol | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| 1,1'-Biphenyl | 200 | J | 110 | J | 5100 | J | 420 | U | 340 | U |
| 2-Chloronaphthalene | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2-Nitroaniline | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Dimethylphthalate | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 2,6-Dinitrotoluene | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Acenaphthylene | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 3-Nitroaniline | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Acenaphthene | 140 | J | 810 | U | 10000 | J | 420 | U | 120 | J |
| 2,4-Dinitrophenol | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| 4-Nitrophenol | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Dibenzofuran | 420 | | 120 | J | 12000 | U | 420 | U | 340 | U |
| 2,4-Dinitrotoluene | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Diethylphthalate | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Fluorene | 280 | J | 85 | J | 22000 | | 83 | J | 420 | |
| 4-Chlorophenyl-phenyl ether | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Nitroaniline | 1000 | U | 2000 | U | 30000 | U | 1100 | UJ | 860 | UJ |
| 4,6-Dinitro-2-methylphenol | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| N-Nitrosodiphenylamine | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 4-Bromophenyl-phenylether | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Hexachlorobenzene | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Atrazine | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Pentachlorophenol | 1000 | U | 2000 | U | 30000 | U | 1100 | U | 860 | U |
| Phenanthrene | 780 | | 300 | J | 35000 | | 190 | J | 1200 | |
| Anthracene | 210 | J | 310 | J | 9300 | J | 420 | U | 110 | J |
| Carbazole | 75 | J | 810 | U | 4000 | J | 420 | UJ | 340 | U |
| Di-n-butylphthalate | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Fluoranthene | 78 | J | 810 | U | 2100 | J | 220 | J | 160 | J |
| Pyrene | 300 | J | 200 | J | 8000 | J | 990 | | 1100 | |
| Butylbenzylphthalate | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| 3,3'-Dichlorobenzidine | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Benzo(a)anthracene | 260 | J | 160 | J | 6300 | J | 310 | J | 340 | J |
| Chrysene | 400 | | 280 | J | 7300 | J | 550 | | 760 | |
| bis(2-Ethylhexyl)phthalate | 74 | J | 810 | U | 12000 | U | 10000 | | 160 | J |
| Di-n-octylphthalate | 400 | U | 810 | U | 12000 | U | 420 | U | 340 | U |
| Benzo(b)fluoranthene | 240 | J | 130 | J | 2900 | J | 110 | J | 230 | J |
| Benzo(k)fluoranthene | 220 | J | 140 | J | 3100 | J | 97 | J | 210 | J |
| Benzo(a)pyrene | 330 | J | 190 | J | 8600 | J | 120 | J | 330 | J |
| Indeno(1,2,3-cd)pyrene | 140 | J | 87 | J | 2400 | J | 420 | U | 100 | J |
| Dibenzo(a,h)anthracene | 180 | J | 110 | J | 4100 | J | 51 | J | 91 | J |
| Benzo(g,h,i)perylene | 640 | | 380 | J | 3800 | J | 52 | J | 220 | J |

CLARK OIL & REFINING COMPANY

HARTFORD, ILLINOIS

TABLE 1

| Analytical Results (Qualified Data) | | Page 2 |
|---|---|---|
| Case #: 28678 | SDG : EE01K | |
| Site : | CLARK OIL | |
| Lab. : | LIBRTY | |
| Reviewer : | | |
| Date : | | |

| Sample Number : | EE01M | | EE01N | | EE01P | | EE01Q | | EE01R | | EE01S | | EE01T | | EE01W | | EE01X | | EE01Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Location : | X111 | | X112 | | X113 | | X114 | | X115 | | X116 | | X117 | | X118 | | X119 | | X120 | |
| Matrix : | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | | Soil | |
| Units : | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | | ug/Kg | |
| Date Sampled : | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | | 11/02/2000 | |
| Time Sampled : | 09:35 | | 10:05 | | 11:05 | | 12:00 | | 12:15 | | 13:25 | | 13:25 | | 14:20 | | 14:35 | | 15:40 | |
| %Moisture : | 16 | | 29 | | 29 | | 4 | | 26 | | 18 | | 19 | | 18 | | 22 | | 4 | |
| pH : | | | | | | | | | | | | | | | | | | | | |
| Dilution Factor : | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | | 1.0 | |
| **Volatile Compound** | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| Dichlorodifluoromethane | 12 | U | 70 | U | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Vinyl Chloride | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromomethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Trichlorofluoromethane | 12 | U | 70 | U | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Acetone | 43 | J | 70 | UJ | 23 | J | 8000 | UJ | 34 | UJ | 49 | J | 52 | J | 20 | UJ | 210 | J | 130 | J |
| Carbon Disulfide | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methyl Acetate | 12 | UJ | 70 | UJ | 14 | UJ | 8000 | U | 13 | UJ | 14 | UJ | 14 | UJ | 20 | UJ | 64 | UJ | 9 | UJ |
| Methylene Chloride | 17 | | 70 | U | 22 | | 8000 | U | 14 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| trans-1,2-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methyl tert-Butyl Ether | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1-Dichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| cis-1,2-Dichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 2-Butanone | 23 | J | 70 | U | 5 | J | 8000 | UJ | 6 | J | 9 | J | 14 | U | 20 | U | 33 | J | 22 | |
| Chloroform | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,1-Trichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Cyclohexane | 12 | U | 200 | | 14 | U | 58000 | | 1 | J | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Carbon Tetrachloride | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Benzene | 12 | U | 70 | U | 14 | U | 7100 | J | 3 | J | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Trichloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Methylcyclohexane | 1 | J | 710 | | 14 | U | 130000 | | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 1 | J |
| 1,2-Dichloropropane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromodichloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| cis-1,3-Dichloropropene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 4-Methyl-2-pentanone | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Toluene | 2 | J | 16 | J | 3 | J | 1800 | J | 2 | J | 2 | J | 14 | U | 20 | U | 64 | U | 2 | J |
| trans-1,3-Dichloropropene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2-Trichloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Tetrachloroethene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 1 | J | 3 | J | 64 | U | 9 | U |
| 2-Hexanone | 12 | U | 70 | UJ | 14 | U | 8000 | UJ | 13 | U | 14 | U | 14 | UJ | 20 | UJ | 64 | UJ | 9 | UJ |
| Dibromochloromethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dibromoethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Chlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Ethylbenzene | 12 | U | 30 | J | 14 | U | 10000 | | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Xylenes (total) | 12 | U | 1000 | | 14 | U | 34000 | | 2 | J | 14 | U | 14 | U | 20 | U | 64 | U | 4 | J |
| Styrene | 12 | U | 20 | J | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Bromoform | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| Isopropylbenzene | 12 | U | 39 | J | 14 | U | 2900 | J | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,1,2,2-Tetrachloroethane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,3-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,4-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2-Dibromo-3-chloropropane | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |
| 1,2,4-Trichlorobenzene | 12 | U | 70 | U | 14 | U | 8000 | U | 13 | U | 14 | U | 14 | U | 20 | U | 64 | U | 9 | U |

Clayton
GROUP SERVICES

# APPENDIX T-4

## VIOLATION NOTICE M-2001-01105
## APRIL 18, 2001

Premcor

Premier People,
Products and Services

The Premcor Refining Group
Hartford Refinery
201 East Hawthorne
Hartford, Illinois 62048-0007
618-254-7301
618-254-6064 fax

March 29, 2002

Illinois Environmental Protection Agency
Attn.: Joyce L. Munie, P.E.
Manager, Permit Section, Bureau of Land
1021 North Grand Avenue East, P.O. Box 19276
Springfield, Illinois 62794-9276

FILE NUMBER 070.35.73

RETAIN IN FILE UNTIL

Re: Violation Notice No. M-2001-0105
1190500002 – Madison County
The Premcor Refining Group Inc.
ILD041889023
DAF Area Closure and Roll-Off Area Closure

Dear Ms. Munie:

On October 3, 2001, the Illinois Environmental Protection Agency ("Illinois EPA") approved the Closure Plan for the Dissolved Air Flotation Unit Area (the "DAF Plan") and the Closure Plan for the Roll-Off Container Area (the "Roll-Off Plan") relating to The Premcor Refining Group Inc.'s ("Premcor") Hartford Refinery. These plans established closure periods as 180 days from the day of Illinois EPA's approval, or April 1, 2002. Premcor submitted these plans in partial response to Violation Notice No. M-2001-0105 issued by Illinois EPA on April 18, 2001.

Since the plans' approval several significant events have occurred:

In November, 2001 for the Roll-Off Container Area and February, 2001 for the DAF Area, Premcor implemented the soil sampling provisions of the plans;

On December 18, 2001, Illinois EPA issued Violation Notice No. L-2001-01421 that involved allegation violations of the groundwater quality beneath the Hartford refinery;

On February 28, 2002, Premcor announced the planned shutdown of refining operations that will lead to the decommissioning of the Hartford refinery; and, finally,

On March 14, 2002, Illinois EPA issued a Notice of Intent to Pursue Legal Action related to an alleged failure to respond adequately to the above-referenced Violation Notices: this Notice was issued 18 days before the end of the Illinois EPA-established closure period.

DAF Area Closure Activity

The DAF Area is underlain by concrete footers that supports the nearby operating production equipment; the DAF unit and the Sanitary Clow. Initially, Premcor believed that the concrete extended below the entire area of the release discovered during the Agency's inspection. However, based on Premcor's additional investigation, these concrete footers do not extend beneath the entire DAF Area. Therefore, on February 7, 2002, Premcor conducted soil sampling beneath the previously replaced crushed rock. The summary of this sampling is attached as the Summary of Soil Analytical Data, DAF Area.

Constituents were detected inconsistently in the subsoil, both in species and spatially. The detections appear unrelated to the release from the DAF unit detected during the February 20, 2001 Illinois EPA inspection. Further excavation to meet TACO Tier 1 ("clean closure") criteria is not feasible due to the inconsistent nature of the contamination.

Additionally, Premcor believes that any additional excavation between the DAF unit and the Clow would threaten the foundation stability of the equipment. This equipment will continue to operate after the anticipated closing of the refinery. Consequently, it is not feasible at this time to conduct further excavation in this area.

Roll-Off Area Closure Activity

Premcor previously removed approximately thirty (30) cubic yards of soil from the Roll-Off Area. in April, 2001, Premcor conducted soil sampling beneath the replacement backfill material. The approved Roll-Off Plan did not include groundwater sampling because groundwater was not considered a completed migrational pathway for any releases from this area. The summary of the sampling is attached as the Summary of Soil Analytical Data, Roll-Off Storage Area.

Constituents were detected inconsistently in the subsoil, both in species and spatially. In some instances, higher concentrations of constituents were detected in the deeper interval of a sample location. Because of these variations, the detected constituents appeared unrelated to any releases from the Roll-Off Area. Premcor does not consider further excavation to meet TACO Tier 1 ("clean closure") criteria feasible due to the inconsistent nature of the contamination.

Burns and McDonell performed a Tier 2 evaluation in accordance with 35 IAC 742 for benzo(a)pyrene in surface soil at the Roll-Off Container Area. The evaluation consisted of calculating Tier 2 objectives for the soil ingestion and soil component of the groundwater ingestion exposure routes. Since a Tier 1 soil inhalation objective for benzo(a)pyrene is not provided in TACO guidance and inhalation toxicity data is not available, a Tier 2 objective for soil inhalation was not calculated.

Data provided for the Tier 2 evaluation consisted of surface soil sample data collected in November 2001. The surface samples were collected from approximately 3 to 6 inches below grade. For a few of these surface samples, a second sample was collected from approximately 17 to 19 inches below grade to aid in determining the vertical extent of contamination in the surface soil. Samples were analyzed for benzene, toluene, ethylbenzene, and total xylenes (BTEX), polynuclear aromatic hydrocarbons (PAHs), inorganics, total organic carbon, and pH. Results of the sampling indicated positive detections of benzo(a)pyrene in 24 of a total of 37 samples collected at concentrations ranging from 0.021 mg/kg to 110 mg/kg. A total of 17 samples collected exceeded the Tier 1 objective of 0.8 mg/kg for the soil ingestion exposure route for an industrial worker at an industrial/commercial property. In addition, a total of 7 samples exceeded the Tier 1 objective of 8 mg/kg for the Class I soil component of the groundwater exposure route pathway.

Tier 2 remediation objectives for soil ingestion were calculated using the Soil Screening Level (SSL) equation S3 for carcinogenic contaminants. The equation was used to calculate Tier 2 objectives under two scenarios, industrial worker and construction worker. Under Tier 2, using the default and chemical property values provided within TACO guidance results in the same objectives provided under Tier 1 (0.8 mg/kg for industrial-commercial and 17 mg/kg for construction worker). Since 65% of the samples collected in November 2001 were above detection limits, this provision was used to determine an average concentration. The average concentration of benzo(a)pyrene in the 37 soil samples collected is 8.53 mg/kg. While this average is above than the industrial worker soil objective for ingestion (0.8 mg/kg), it is less than the construction worker objective for ingestion (17 mg/kg).

A Tier 2 remediation objective for the soil component of the groundwater ingestion exposure route was calculated using the Risked-Base Corrective Action (RBCA) equation R12. This equation depends on site specific characteristics including site hydrogeology, source dimensions, and the downgradient distance to the property boundary. The Tier 2 calculation for the soil component of the groundwater ingestion route resulted in a remediation objective of 2.22 x 1018 mg/kg, well above the highest level of benzo(a)pyrene detected in the soil samples (110 mg/kg). Reasons for the high remediation objective include the long downgradient distance to the property boundary (approximately 3000 feet), the immobile nature of benzo(a)pyrene, and the high fractional of organic carbon found in the soil.

In summary, based on the Tier 2 calculations for ingestion and the soil component of groundwater ingestion, and the use of averaging analytical results, both the construction worker ingestion remediation objective and the calculated soil component of groundwater ingestion remediation objective are higher than the average soil concentration of benzo(a)pyrene. However, the industrial worker remediation objective remains lower than the average soil concentration in this area.

As provided in Illinois EPA's approvals (condition/modification 4. b.), a Post Closure Care Plans may be necessary at the DAF Area and the Roll-Off area pursuant to 35 Ill. Adm. Code, Subpart G. Given an anticipated enforcement document related to most recent Violation Notice and the anticipated closure of the refinery, Premcor intends to obtain alternative requirements for post closure care pursuant to 35 Ill. Adm. Code 703.161(a).

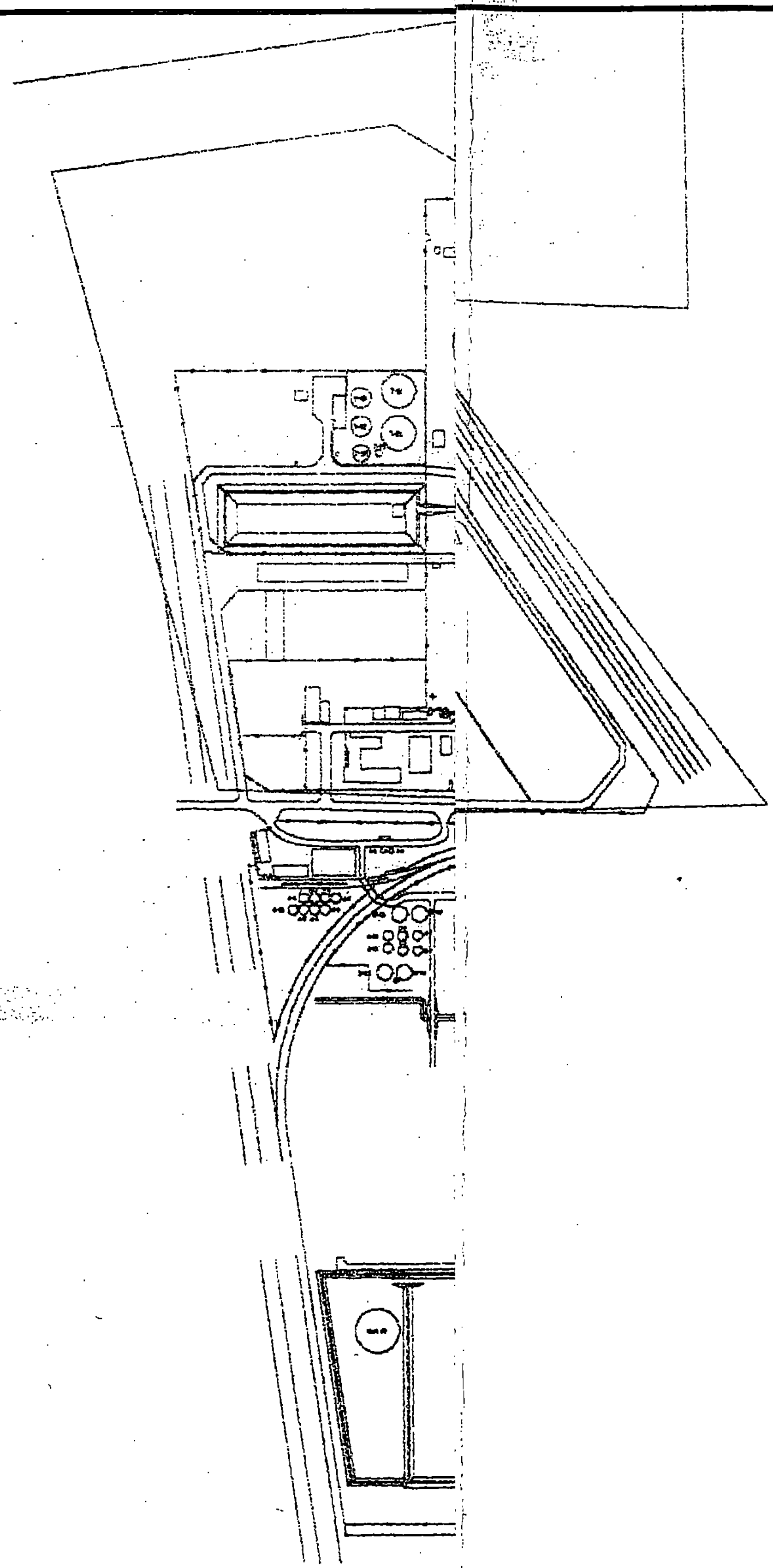
Premcor has scheduled a meeting the Illinois EPA on April 3, 2002 to discuss the resolution of Notice of Intent to Pursue Legal Action for Violation Notices M-2001-01015 and L-2001-01421. Premcor is requesting the Illinois EPA issue an enforceable document containing alternative requirements for post-closure care at the DAF Area and the Roll-Off Area. Furthermore, we are proposing that the details of such a document be developed during our April 3rd meeting. Please feel free to contact me with any questions at (618) 254-301 ext. 266.

Sincerely,

Bill R. Irwin

Bill R. Irwin
Environmental Manager
Hartford Refinery

Attachment



Burns & McDonnell
SINCE 1898

Figure 1–2
SITE MAP
ROLL-OFF AREA
PREMCOR REFINERY
HARTFORD, ILLINOIS

## Table 1
## SUMMARY OF SOIL ANALYTICAL DATA
## THE PREMCOR REFINING GROUP, INC.
## ROll-OFF STORAGE AREA
## HARTFORD, ILLINOIS

| Sample Number: | | PR-001-S-3-6" | PR-002-S-3-6" | PR-003-S-3-6" | PR-004-S-3-6" | PR-005-S-3-6" | PR-006-S-3-6" | PR-007-S-3-6" | PR-009-S-3-6" | IEPA TACO Tier 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | |
| Sample Location: | | | | | | | | | | |
| PARAMETERS | UNITS | | | | | | | | | |
| Benzene | µg/kg | 1.4J | 0.6J | 0.8J | 0.8J | 0.6J | 0.6J | ND(2.1) | 1.3J | 30 |
| Toluene | µg/kg | 1.3J | 2.2J | ND(5.0) | 2.3J | 2.3J | 1.6J | ND(5.3) | 2.1J | 13,00[illegible] |
| Ethylbenzene | µg/kg | 3.7J | 1.9J | ND(5.0) | 2.1J | 2.1J | 1.6J | ND(5.3) | 1.4J | 12,00[illegible] |
| Xylenes | µg/kg | ND(5.5) | 6.7 | ND(5.0) | 6.4 | 6.7 | 5.6 | ND(5.3) | 4.4J | 150,000 |
| PNA Constituents | | | | | | | | | | |
| Naphthalene | mg/kg | ND (0.012) | ND (0.012) | ND(0.056) | ND(0.062) | ND(0.063) | ND(0.059) | ND(0.058) | ND (0.012) | 84 |
| Acenaphthylene | mg/kg | 0.3 | ND (0.012) | ND(0.056) | ND(0.062) | ND(0.063) | ND(0.059) | ND(0.058) | 0.16 | -- |
| Acenaphthene | mg/kg | ND (0.012) | 1.1 | ND(0.056) | ND(0.062) | ND(0.063) | ND(0.059) | ND(0.058) | ND(0.012) | 570 |
| Fluorene | mg/kg | 0.099 | 0.15 | ND(0.056) | ND(0.062) | ND(0.063) | 0.14 | ND(0.058) | 0.027 | 560 |
| Phenanthrene | mg/kg | 0.76 | 1.9 | 0.38 | 0.48 | 0.66 | 1.6 | 0.75 | 0.54 | -- |
| Anthracene | mg/kg | ND (0.012) | ND (0.012) | ND(0.056) | ND(0.062) | ND(0.063) | ND(0.059) | ND(0.058) | ND(0.012) | 12,000 |
| Fluoranthene | mg/kg | 0.74 | 2.1 | 0.33 | 0.37 | 0.38 | ND(0.059) | 1.1 | 0.74 | 3,100 |
| Pyrene | mg/kg | 0.26 | 1.6 | 0.89 | ND(0.062) | 0.57 | 1.8 | 0.82 | 0.25 | 2,300 |
| Benzo(a)anthracene | mg/kg | 0.47 | 1.2 | 0.095 | 0.41 | 0.43 | 1.4 | 0.63 | 0.48 | 2 |
| Chrysene | mg/kg | 0.98 | 2.7 | 0.35 | 1.1 | 1.2 | 4.5 | 0.8 | 0.55 | 88 |
| Benzo(b)fluoranthene | mg/kg | ND (0.059) | 1.8 | 0.15 | 0.87 | 1.5 | 3.2 | 1.1 | ND(0.058) | 5 |
| Benzo(k)fluoranthene | mg/kg | ND (0.059) | 0.08J | 0.18 | 0.65 | 0.15 | 0.46 | ND(0.058) | ND(0.058) | 9 |
| Benzo(a)pyrene | mg/kg | ND (0.059) | 1.2 | 0.48 | 0.91 | 1.2 | 3.2 | 1.4 | ND(0.058) | 0.8 |
| Dibenzo(a,h)anthracene | mg/kg | 0.15 | ND (0.012) | ND(0.056) | ND(0.062) | ND(0.063) | ND(0.059) | ND(0.058) | ND(0.058) | 0.8 |
| Benzo(g,h,i)perylene | mg/kg | ND (0.059) | ND (0.012) | ND(0.056) | ND(0.062) | 0.56 | 0.6 | 0.48 | ND(0.058) | -- |
| Indeno(1,2,3-cd)pryene | mg/kg | 0.06J | ND (0.012) | 0.18 | 0.06J | 0.1 | 0.21 | 0.12 | 0.059 | 0.9 |
| Cyanide | mg/kg | ND(0.49) | 0.19J | ND(0.49) | 0.21J | ND(0.49) | ND(0.44) | ND(0.47) | ND(0.47) | 40 |
| Chromium | mg/kg | 36.2 | 23 | 66.9 | 32.1 | 24.6 | 34.7 | 12.3 | 69.6 | 420* |
| Nickel | mg/kg | 46.2 | 34.8 | 29.6 | 27.4 | 26 | 40.5 | 46.7 | 30.3 | 700 |
| Lead | mg/kg | 299 | 69.5 | 70.1 | 58.3 | 345 | 117 | 18.2 | 81 | 400* |
| Total organic carbon | | >60,000 | >60,000 | >60,000 | >60,000 | >60,000 | >60,000 | >60,000 | 50,000 | |
| pH | S.U. | 7.33 | 8.11 | 8.24 | 8.07 | 8.23 | 8.06 | 7.99 | 8.16 | |

IEPA TACO Tier 1 = Most stringent of Tier 1 industrial/commercial exposure pathways from the Illinois Environmental Protection Agency Title 35 Subtitle G, Chapter I, subchapter f, PART 742; Tiered Approach to Corrective Action Objectives

µg/kg = Micrograms per liter

mg/kg = Milligrams per kilogram

ND (0.013) = Not detected (detection limit)

* Based on ingestion and inhalation pathways

rolloflab

## Table 1
## SUMMARY OF SOIL ANALYTICAL DATA
## THE PREMCOR REFINING GROUP, INC.
## ROll-OFF STORAGE AREA
## HARTFORD, ILLINOIS

| Sample Number: | | PR-010-S-3-6" | PR-011-S-3-6" | PR-012-S-3-6" | PR-013-S-3-6" | PR-014-S-3-6" | PR-015-S-3-6" | PR-016-S-3-6" | PR-017-S-3-6" | PR-018-S-3-6" | IEPA TACO Tier 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | |
| Sample Location: | | | | | | | | | | | |
| PARAMETERS | UNITS | | | | | | | | | | |
| Benzene | µg/kg | 1.1J | ND(2.4) | ND(2.3) | ND(2.8) | ND(3.4) | ND(2.6) | 1.3 J | ND(2.4) | 0.7J | 30 |
| Toluene | µg/kg | 1.4 | ND(6.0) | ND(5.7) | ND(6.4) | ND(8.6) | ND(6.4) | 2.4 | ND(5.8) | ND(4.3) | 13,000 |
| Ethylbenzene | µg/kg | ND(4.8) | ND(6.0) | ND(5.7) | ND(6.4) | ND(8.6) | ND(6.4) | 1.2 | ND(5.8) | ND(4.8) | 12,000 |
| Xylenes | µg/kg | 1.2J | ND(6.0) | ND(5.7) | ND(6.4) | ND(8.6) | ND(6.4) | 2.9 | ND(5.8) | ND(4.1) | 150,000 |
| PNA Constituents | | | | | | | | | | | |
| Naphthalene | mg/kg | ND(0.050) | ND(2.9) | ND(0.84) | ND(0.92) | ND(0.31) | ND(1.9) | ND(0.056) | ND(0.024) | ND(0.011) | 84 |
| Acenaphthylene | mg/kg | ND(0.050) | ND(2.9) | ND(0.84) | ND(0.92) | ND(0.31) | ND(1.9) | ND(0.056) | ND(0.024) | ND(0.011) | -- |
| Acenaphthene | mg/kg | 0.72 | 5.7 | 41 | 46 | 17 | 84 | ND(0.056) | ND(0.024) | ND(0.011) | 570 |
| Fluorene | mg/kg | 0.12 | ND(2.9) | ND(0.84) | ND(0.92) | ND(0.31) | ND(1.9) | 0.26 | ND(0.024) | ND(0.011) | 560 |
| Phenanthrene | mg/kg | 0.6 | 10 | 18 | 22 | 7.4 | 32 | 0.62 | ND(0.024) | 0.028 | -- |
| Anthracene | mg/kg | ND(0.050) | ND(2.9) | ND(0.84) | ND(0.92) | ND(0.31) | ND(1.9) | ND(0.056) | ND(0.024) | ND(0.011) | 12,000 |
| Fluoranthene | mg/kg | 0.43 | 6.3 | 6.6 | 5.5 | ND(0.31) | 15 | ND(0.056) | ND(0.024) | 0.043 | 3,100 |
| Pyrene | mg/kg | 0.56 | 9.5 | 21 | 28 | 9.9 | 44 | 0.52 | ND(0.024) | ND(0.011) | 2,300 |
| Benzo(a)anthracene | mg/kg | 0.57 | 7.6 | 14 | 17 | 6.3 | 28 | 0.28 | ND(0.019) | 0.11 | 2 |
| Chrysene | mg/kg | 2 | 25 | 57 | 62 | 25 | 150 | 1.3 | ND(0.024) | ND(0.011) | 88 |
| Benzo(b)fluoranthene | mg/kg | ND(0.050) | 15 | 24 | ND(0.92) | ND(0.31) | 64 | 1.1 | ND(0.024) | ND(0.011) | 5 |
| Benzo(k)fluoranthene | mg/kg | ND(0.050) | 3.5 | 3.9 | ND(0.92) | 9.8 | 32 | 0.47 | ND(0.024) | ND(0.011) | 9 |
| Benzo(a)pyrene | mg/kg | 1.4 | 28 | 28 | 31 | 13 | 110 | 1.2 | ND(0.024) | ND(0.011) | 0.8 |
| Dibenzo(a,h)anthracene | mg/kg | ND(0.050) | ND(2.9) | 4 | 5.1 | ND(0.31) | ND(1.9) | 1.4 | ND(0.024) | ND(0.011) | 0.8 |
| Benzo(g,h,i)perylene | mg/kg | ND(0.050) | ND(2.9) | 2.7 | 6.2 | 1.3 | 27 | 0.45 | ND(0.024) | ND(0.011) | -- |
| Indeno(1,2,3-cd)pryene | mg/kg | 0.08 | ND(2.9) | 0.8 | 2.8 | 1.1 | 9 | 0.086 | ND(0.024) | ND(0.011) | 0.9 |
| Cyanide | mg/kg | 0.49J | ND(0.58) | ND(0.57) | ND(0.62) | ND(0.62) | ND(0.62) | 0.17 | 0.4 | ND(0.54) | 40 |
| Chromium | mg/kg | 51.7 | 34 | 41.3 | 28.4 | 28 | 51.1 | 311 | 27.2 | 25.5 | 420* |
| Nickel | mg/kg | 68.8 | 81.4 | 82.5 | 28 | 22.3 | 43.6 | 35.2 | 25.7 | 16.1 | 700 |
| Lead | mg/kg | 829 | 46.7 | 467 | 73 | 141 | 64.6 | 123 | 235 | 47.2 | 400* |
| Total organic carbon | mg/kg dry | >60,000 | >60,000 | >60,000 | >60,000 | >60,000 | >60,000 | >60,000 | 34,000 | 22,000 | |
| pH | S.U. | 8.62 | 8.22 | 8.69 | 7.05 | 8.33 | 7.59 | 8.68 | 8.1 | 7.07 | |

IEPA TACO Tier 1 = Most stringent of Tier 1 industrial/commercial exposure pathways from the Illinois Environmental Protection Agency Title 35 Subtitle G, Chapter I, subchapter f, PART 742; Tiered Approach to Corrective Action Objectives

µg/kg = Micrograms per liter

mg/kg = Milligrams per kilogram

ND (0.013) = Not detected (detection limit)

* Based on ingestion and inhalation pathways

rolloftab

**Table 1**
**SUMMARY OF SOIL ANALYTICAL DATA**
**THE PREMCOR REFINING GROUP, INC.**
**ROll-OFF STORAGE AREA**
**HARTFORD, ILLINOIS**

| Sample Number: | | PR-118-S-3-6" | PR-019-S-3-6" | PR-020-S-3-6" | PR-021-S-3-6" | PR-022-S-3-6" | PR-023-S-3-6" | PR-024-S-3-6" | PR-025-S-3-6" | PR-026-S-3-6" | IEPA TACO Tier 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | |
| Sample Location: | | | | | | | | | | | |
| PARAMETERS | UNITS | | | | | | | | | | |
| Benzene | µg/kg | 0.7 J | ND(2.3) | 0.7 J | 0.8 J | 4.5 | 1.6 J | ND(2.1) | ND(2.9) | 0.8 | 30 |
| Toluene | µg/kg | ND(5.9) | ND(5.7) | ND(6.5) | ND(5.8) | 5.7 J | ND(5.6) | ND(5.4) | ND(7.3) | ND(6.8) | 13,000 |
| Ethylbenzene | µg/kg | ND(5.9) | ND(5.7) | ND(6.5) | ND(5.8) | 1.7 J | ND(5.6) | ND(5.4) | ND(7.3) | ND(6.8) | 12,000 |
| Xylenes | µg/kg | ND(5.9) | ND(5.7) | ND(6.5) | ND(5.8) | 2.5 J | ND(5.6) | ND(5.4) | ND(7.3) | ND(6.8) | 150,000 |
| PNA Constituents | | | | | | | | | | | |
| Naphthalene | mg/kg | ND(0.013) | 0.14 | 0.73 | ND(0.025) | ND(0.013) | ND(0.012) | ND(0.012) | ND(0.65) | ND(0.014) | 84 |
| Acenaphthylene | mg/kg | ND(0.013) | 0.12 | 1.1 | ND(0.025) | ND(0.013) | ND(0.012) | ND(0.012) | ND(0.65) | ND(0.014) | -- |
| Acenaphthene | mg/kg | ND(0.013) | ND(0.013) | ND(0.026) | ND(0.025) | ND(0.013) | ND(0.012) | ND(0.012) | ND(0.65) | ND(0.014) | 570 |
| Fluorene | mg/kg | ND(0.013) | 0.03 | 0.36 | 0.054 | 0.23 | ND(0.012) | ND(0.012) | 0.65 | ND(0.014) | 560 |
| Phenanthrene | mg/kg | ND(0.013) | 0.2 | 1.5 | 0.52 | 0.89 | ND(0.012) | ND(0.012) | 3.9 | ND(0.014) | -- |
| Anthracene | mg/kg | ND(0.013) | ND(0.013) | ND(0.026) | ND(0.025) | ND(0.013) | ND(0.012) | ND(0.012) | ND(0.65) | ND(0.014) | 12,000 |
| Fluoranthene | mg/kg | ND(0.013) | 0.18 | 0.7 | 0.33 | 0.57 | ND(0.012) | ND(0.012) | 3.6 | ND(0.014) | 3,100 |
| Pyrene | mg/kg | ND(0.013) | 0.26 | 0.75 | 0.29 | 0.39 | ND(0.012) | ND(0.012) | 3.2 | ND(0.014) | 2,300 |
| Benzo(a)anthracene | mg/kg | ND(0.010) | ND(0.010) | ND(0.021) | ND(0.020) | 0.18 | ND(0.010) | ND(0.010) | 3.4 | ND(0.011) | 2 |
| Chrysene | mg/kg | ND(0.013) | 0.67 | 2.1 | ND(0.025) | 0.32 | ND(0.012) | ND(0.012) | 2.1 | ND(0.014) | 88 |
| Benzo(b)fluoranthene | mg/kg | ND(0.013) | 0.56 | ND(0.026) | 0.64 | ND(0.066) | ND(0.012) | ND(0.012) | 1.8 | ND(0.014) | 5 |
| Benzo(k)fluoranthene | mg/kg | ND(0.013) | ND(0.013) | 0.75 | ND(0.025) | ND(0.066) | ND(0.012) | ND(0.012) | 0.28 | ND(0.014) | 9 |
| Benzo(a)pyrene | mg/kg | ND(0.013) | 0.28 | 2.6 | 1.1 | 0.77 | ND(0.012) | ND(0.012) | 3.5 | ND(0.014) | 0.8 |
| Dibenzo(a,h)anthracene | mg/kg | ND(0.013) | ND(0.013) | ND(0.013) | ND(0.025) | ND(0.066) | ND(0.012) | ND(0.012) | 3.4 | ND(0.014) | 0.8 |
| Benzo(g,h,i)perylene | mg/kg | ND(0.013) | ND(0.013) | ND(0.013) | 0.34 | ND(0.066) | ND(0.012) | ND(0.012) | ND(0.25) | ND(0.014) | -- |
| Indeno(1,2,3-cd)pryene | mg/kg | ND(0.013) | ND(0.013) | ND(0.013) | 0.062 | ND(0.066) | ND(0.012) | ND(0.012) | 0.42 | ND(0.014) | 0.9 |
| Cyanide | mg/kg | ND(0.62) | ND(0.62) | 0.28 | ND(0.65) | ND(0.63) | ND(0.62) | ND(0.63) | 0.25 | ND(0.71) | 40 |
| Chromium | mg/kg | 27.2 | 25.1 | 29.6 | 24.7 | 32.5 | 18 | 21.1 | 33.8 | 28.3 | 420* |
| Nickel | mg/kg | 24.5 | 20 | 28.9 | 31 | 32.3 | 11.7 | 14.9 | 49.5 | 29.2 | 700 |
| Lead | mg/kg | 140 | 83.7 | 50.3 | 22.2 | 70.1 | 18.7 | 25.3 | 218 | 17.8 | 400* |
| Total organic carbon | mg/kg dry | 22,000 | 25,000 | > 60,000 | 4,200 | > 60,000 | 16,000 | 22,000 | >60,000 | 7,500 | |
| pH | S.U. | 7.15 | 7.11 | 8.13 | 8.02 | 8.25 | 7.41 | 7.18 | 7.69 | 7.71 | |

IEPA TACO Tier 1 = Most stringent of Tier 1 industrial/commercial exposure pathways from the Illinois Environmental Protection Agency Title 35 Subtitle G, Chapter I, subchapter f, PART 742; Tiered Approach to Corrective Action Objectives
µg/kg = Micrograms per liter
mg/kg = Milligrams per kilogram
ND (0.013) = Not detected (detection limit)
* Based on ingestion and inhalation pathways

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Table 1
SUMMARY OF SOIL ANALYTICAL DATA
THE PREMCOR REFINING GROUP, INC.
ROll-OFF STORAGE AREA
HARTFORD, ILLINOIS

| Sample Number: | | PR-027-S-3-6" | PR-028-S-3-6" | PR-029-S-3-6" | PR-129-S-3-6" | PR-030-S-3-6" | IEPA TACO Tier 1 |
|---|---|---|---|---|---|---|---|
| Sample Date: | | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | 11/07/2001 | |
| Sample Location: | | | | | | | |
| PARAMETERS | UNITS | | | | | | |
| Benzene | µg/kg | ND(2.2) | 0.8 J | 0.7 J | 0.7 J | 0.7 J | 30 |
| Toluene | µg/kg | ND(5.8) | ND(6.9) | ND(5.9) | ND(5.8) | ND(5.9) | 13,000 |
| Ethylbenzene | µg/kg | ND(5.8) | ND(6.9) | ND(5.9) | ND(5.8) | ND(5.9) | 12,000 |
| Xylenes | µg/kg | ND(5.8) | ND(6.9) | ND(5.9) | ND(5.8) | ND(5.9) | 150,000 |
| PNA Constituents | | | | | | | |
| Naphthalene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 84 |
| Acenaphthylene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | -- |
| Acenaphthene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 570 |
| Fluorene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 560 |
| Phenanthrene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | -- |
| Anthracene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 12,000 |
| Fluoranthene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 3,100 |
| Pyrene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 2,300 |
| Benzo(a)anthracene | mg/kg | ND(0.010) | ND(0.011) | ND(0.010) | ND(0.010) | ND(0.010) | 2 |
| Chrysene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 88 |
| Benzo(b)fluoranthene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 5 |
| Benzo(k)fluoranthene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 9 |
| Benzo(a)pyrene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 0.8 |
| Dibenzo(a,h)anthracene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 0.8 |
| Benzo(g,h,i)perylene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | -- |
| Indeno(1,2,3-cd)pryene | mg/kg | ND(0.013) | ND(0.014) | ND(0.012) | ND(0.013) | ND(0.012) | 0.9 |
| Cyanide | mg/kg | ND(0.61) | ND(0.70) | ND(0.62) | ND(0.62) | ND(0.61) | 40 |
| Chromium | mg/kg | 22.4 | 24.7 | 16.9 | 20.7 | 19.3 | 420* |
| Nickel | mg/kg | 12.1 | 21.2 | 10.8 | 13 | 17.1 | 700 |
| Lead | mg/kg | 44.6 | 18.6 | 27.3 | 27 | 48.8 | 400* |
| Total organic carbon | mg/kg dry | 19,000 | 9,500 | 16,000 | 16,000 | 15,000 | |
| pH | S.U. | 7.82 | 6.44 | 6.19 | 6.82 | 7.31 | |

IEPA TACO Tier 1 = Most stringent of Tier 1 industrial/commercial exposure pathways from the Illinois Environmental Protection Agency Title 35 Subtitle G, Chapter I, subchapter f, PART 742; Tiered Approach to Corrective Action Objectives
µg/kg = Micrograms per liter
mg/kg = Milligrams per kilogram
ND (0.013) = Not detected (detection limit)
* Based on ingestion and inhalation pathways

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# Table 1
## SUMMARY OF SOIL ANALYTICAL DATA
## THE PREMCOR REFINING GROUP, INC.
## ROll-OFF STORAGE AREA
## HARTFORD, ILLINOIS

| Sample Number: | | PR-016-S-17-19" | PR-015-S-17-19" | PR-014-S-17-19" | PR-013-S-17-19" | PR-012-S-17-19" | PR-011-S-17-19" | PR-010-S-17-19" | PR-008-S-17-19" | IEPA TACO Tier 1 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date: | | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | 11/01/2001 | |
| Sample Location: | | | | | | | | | | |
| PARAMETERS | UNITS | | | | | | | | | |
| Benzo(a)pyrene | mg/kg | ND(0.013) | 0.023 | 0.021 | 0.15 | 0.071 | ND(0.012) | 72 | 14 | 0.8 |

IEPA TACO Tier 1 = Most stringent of Tier 1 industrial/commercial exposure pathways from the Illinois Environmental Protection Agency Title 35 Subtitle G, Chapter I, subchapter f, PART 742; Tiered Approach to Corrective Action Objectives

µg/kg = Micrograms per liter

mg/kg = Milligrams per kilogram

ND (0.013) = Not detected (detection limit)

* Based on ingestion and inhalation pathways

# APPENDIX U

# APPENDIX U

# APPENDIX U

## DOCUMENTS RELATED TO THE GROUNDWATER AREA

HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

referred the matter to the Illinois Attorney General's Office in late May 1990.

On June 6, 1990, the state agencies met with representatives of the three oil companies that have oil refining related facilities near Hartford and with the village mayor. The oil companies would not agree either singly or jointly to expend the funds to install and operate a more aggressive recovery system without a determination of whose product was the source of the problem. However, they did agree to provide technical assistance in furtherance of determining the source or sources of the hydrocarbon plume, and also to determine whether exposures to the residents of Hartford from the vapors seeping into their homes were a continuing health threat. Three committees were formed to accomplish these tasks with state agency personnel being assigned to lead each. The village mayor expressed an opinion that a wider search for other potentially responsible parties would be appropriate since several pipelines were known to be in or near the village either currently or at various times in the past.

One of the three committees was to consolidate the hydrogeologic data available from various sources and develop a comprehensive description of the current hydrogeological setting as it affects the hydrocarbon plume. In contrast to most other sites, a fairly large amount of data was available on the local geology. This was a result of prior work done by both Amoco and Shell pursuant to their RCRA Subpart F groundwater monitoring activities (i.e., on-going hazardous waste regulation compliance), work done by Shell to define and design a cleanup plan for their December 1989, spill and the previous Hartford investigatory efforts of 1978. A cooperative effort was undertaken to obtain groundwater levels and product thickness on one day from all existing monitoring wells. This data was used to determine that the current direction of groundwater flow is to the northeast in the northern half of Hartford. Further, the hydrocarbon appears to be pooled in a depression in the top of a permeable sand layer. The IEPA estimates that the amount of hydrocarbon pooled could range from approximately 900 thousand gallons to 3.8 million gallons. [redacted] The current location of the plume is very consistent with an origin being either the Clark pipelines which traverse Hartford on an east-west axis from the refinery to their barge loading facility or from one of two north-south pipelines which parallel Olive Street on Hartford's eastern border.

Another of the technical committees formed was to sample the hydrocarbon at several points and determine if the chemical composition of the samples could provide information that

# HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

[redacted]

ILLINOIS EPA REPORT

# HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

## INVESTIGATIONS OF 1978

The first odor complaints received in 1978 came on March 20th from [redacted] West Birch Street. A fire subsequently occurred there on March 24th. Several other fires occurred shortly thereafter involving or originating in basement floor cracks or basement sewer drains. Shell ran soil gas analyses finding a range of volatile hydrocarbons with notable amounts of methane, butanes and pentanes. Shell installed two monitoring wells and found leaded gasoline in one on April 6th. This sample had 2.12 grams per gallon of lead with tetraethyl lead being the major lead alkyl.

The IEPA began investigations on March 28 and were heavily involved through the month of April. Ten soil borings were made and finished as monitoring wells in and around the village. A complete set of water level and hydrocarbon observations were made on May 2 including the two Shell wells. A hydrocarbon thickness of eleven feet six inches was observed in one well with significant amounts in two others and traces in five others.

At the IEPA's suggestion, the village officials invited the oil companies and local utilities to cooperate in a solution. The three oil companies retained John Mathes and Associates, an engineering consultant, to conduct an investigation to determine the possible cause or causes of the problem and to assess the possible solutions to the problem. Mathes published a report of its investigation on July 17 which does not clearly identify a conclusion as to the source of the hydrocarbon; [redacted]. Mathes also concludes that the more pervious backfill in utility trenches throughout northern Hartford probably served as a conduit to spread any leak that occurred such that the spillage has been transferred away from the site of the initial leak. A further conclusion was that, based on the available boring and well logs, a clay layer which appeared continuous and thick lay just east of the village which evidently retarded migration of the floating gasoline. A good correlation was observed between evidence of the location of hydrocarbon accumulation and the odor complaints and fires.

At the request of the IEPA, the Illinois State Geological Survey was brought into the investigations in May. Despite the known hydrocarbon plume, there was still concern that another source(s) accounted for the relatively large amounts of methane observed in soil gas samples. The Survey ran carbon-14 dating analysis on a representative sample. They

HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

According to the reports, recovered amounts of gasoline varied from month to month apparently reflecting changes in hydrocarbon thickness due to the level of the water table and precipitation influences. The total recovery to date approximates one million one hundred sixty thousand gallons. [redacted]

## 1990 INCIDENTS

Complaints of strong gas odors were again received in the spring of 1990 from several residents of Hartford. Fires occurred in homes as a result of accumulation of gasoline vapors in basements and crawl spaces. Explosive levels were detected in several buildings, including a community retirement center. All of these occurred in the area previously known to be underlain by the gasoline plume. Just prior to these occurrences, the IEPA issued a Compliance Inquiry Letter to Clark Oil and Refining Corporation on February 21, 1990 and met with their representatives on March 8 to discuss the status of the recovery operations. This meeting was prompted by the appearance of hydrocarbon in a previously clean well which had been installed by the IEPA in 1978. This well is located on Shell's Tannery property (EPA #7 well). Clark at that time indicated no willingness to expand its recovery operations and asserted that they were not convinced as to the source of the plume and were, therefore, unwilling to increase their involvement. This apparent impasse, coupled with the concern of the IEPA and of the Illinois Department of Public Health regarding the health and safety impacts of the exposures being imposed upon the residents of the north end of Hartford as evidenced by the odors and fires, led these agencies to refer the matter for legal action on May 30, 1990.

The Illinois Attorney General's Office requested that the three oil companies of the Hartford area attend a meeting on June 6 to discuss the installation of a more aggressive hydrocarbon recovery system. At the meeting all the oil companies stated that they would not expend the funds to install and operate an aggressive recovery system without a determination being made as to who was the responsible party. It was agreed, however, to form three committees to investigate the problem. The oil companies were willing to participate by committing technical expertise on the basis of their compassionate concern for the affected citizens of Hartford. One committee was established to evaluate whether a health risk existed to the residents of the most affected houses; particularly since benzene, which is a significant gasoline component, is a known human carcinogen. This

HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION
[ CONFIDENTIAL ]

Hartford/Wood River Terminal. This ten-inch line parallels Olive Street in Hartford next to the Clark Oil line identified in 1 above. It is not in current use.

A map is attached as Figure 1, showing the location of the three refineries and the pipelines in relation to Hartford.

IEPA records contain at least two reported releases from Clark's river lines, during 1978 and 1984. Shell also reported that 294,000 gallons of unleaded gasoline spilled from one of their river lines on December 16, 1989. Attachment 2 contains a copy of IEPA records of these releases.

The Clark product line identified in 1 above may have been leaking when in service according to Mark Shrimpe, Vice President of the Hartford/Wood River Terminal. The terminal formerly received products from this line, but were being shorted 360 barrels a week. The shortage was due to either a leak in the pipeline or malfunctioning gauges at either the terminal or Clark's refinery. Mr. Shrimpe felt the problem was due to a pipeline leak somewhere between the Clark refinery and the Hartford/Wood River Terminal. Clark's line has not been pressure tested to determine if the line has any leaks. A pressure test performed now would not tell us if the line was leaking when in service or if corrosion occurred after the line was drained.

The Sinclair line identified in 4 above is owned by Sinclair and had been operated by ARCO. Mr. Barry Bluth of Sinclair reports the line has been abandoned for about 5 years and was left containing approximately 600 barrels of unleaded gasoline. The unleaded gasoline was reportedly left in the line to prevent corrosion. ARCO admits three known releases: June 7, 1982 - 9 barrels of #2 Fuel Oil; July 12, 1981 - 24 barrels of gasoline; and January 8, 1981 - 5 barrels of gasoline. ARCO and Sinclair evacuated the line the week of August 27, 1990. Sinclair estimated the line would hold approximately 600 barrels of product. Only 350 barrels were recovered, resulting in a shortage of approximately 250 barrels or 10,500 gallons of gasoline. Two pressure tests were conducted on August 31, and September 1, 1990 by Sinclair and observed by the USDOT Office of Pipeline Safety. The pipeline tests failed, indicating a leak in the line. The area and size of the leak are unknown at this time. [redacted] Attachment 3 contains all the correspondence between IEPA, Sinclair, ARCO, and USDOT regarding the Sinclair/ARCO line.

HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

vapor readings and the silt zones above the Main sand, Attachment 6. Mathes raised a concerned about lateral vapor migration from the Shell spill through the Rand Sand into unidentified silt zones found above the Main Sand under Hartford. Shell is presently performing more soil gas survey analyses, and Clark is performing cone penetrometer tests and drilling more borings to determine the validity of Mathes' concern.

The groundwater group determined the hydrocarbon beneath Hartford is present on top of the Main Sand. Based upon the groundwater elevation results taken in April and July 1990, groundwater flow direction in the Main Sand was determined to be towards the northeast. Figure 3 is a July 1990 groundwater surface elevation map of the Main sand beneath Hartford. Flow direction has not changed since July 1978, when John Mathes and Associates determined the flow to also be towards the northeast.

The groundwater group also determined that a depression in the top of the main sand exists in the north end of Hartford, causing the hydrocarbon to pool in this area. The April and July 1990 hydrocarbon measurements confirm this conclusion since the thickest part of the pool is in the northeastern end of Hartford. Figure 4 is a map of the hydrocarbon thickness from July 1990 data. In order for the hydrocarbon to have accumulated in the north end of Hartford, it must have originated from an upgradient source to the southwest. [redacted]

Figure 5 is a three dimensional picture of the hydrocarbon thickness overlying the groundwater surface elevation of the Main Sand as of July 1990. The figure illustrates that in the areas where the water table elevation is lower, the hydrocarbon accumulation is thicker. As the water table elevation lowers, the hydrocarbon thickness in a well will increase. When the water table rises, the situation is reversed and the hydrocarbon thickness in the well will decrease. Hydrocarbon thickness measurements taken during the spring of the year will result in inaccurate data which show a smaller thickness of hydrocarbon in the wells than is actually present.

This observation is a general phenomena. Kembloski and Chiang (1979) describe two factors that can influence a decrease in measurement of hydrocarbon thickness:

1) a difference in the residual saturation of hydrocarbons entrapped above and below the hydrocarbon-water interface; and
2) preferred flow of the liquids through the monitoring well.

Specifically, some of the hydrocarbon can become trapped below the oil-water interface in larger soil pore spaces.

HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

to the Hartford hydrocarbon plume. The closest match the Coast Guard could get was between well EPA-7 and Clark recovery well 2. However, the Coast Guard stated, "The differences between the EPA well and the Clark well were significant enough to preclude conclusive identification."

Shell installed a series of wells (see map in Attachment 9) between the spill site and the EPA-7 well; and between the EPA-7 well and Clark's property. The wells were sampled and no hydrocarbon was found between the EPA-7 and the Rand Avenue spill site. A well nest (i.e., a series of wells screened at staggered depths) was installed near EPA-7 and next to Clark's property (P-80 and P-81). Well P-81 was found to have 1.5 feet of hydrocarbon present. The IEPA performed a second round of sampling on April 3, 1990. Samples were collected from four monitoring wells in Hartford, wells B-31, B-32, B-33, and EPA-4; and from Shell's well P-81 mentioned above. The samples were sent to the IEPA laboratory and analyzed to see if the samples matched any of the previous samples collected on February 1 from Clark recovery wells 1 and 2, EPA-7, or Shell's spill area well SP-3. The analytical results indicated EPA-4 matched B-31, EPA-7 matched B-32, B-33 contained water only, and P-81 did not match any of the samples. The IEPA results are included in Attachment 10.

Subsequent to the June 6 meeting of the oil companies and the state agencies, which is noted previously, the committee charged with characterizing the chemical composition of the hydrocarbon plume met to agree upon sample locations and analytical methods to be used. This meeting occurred on June 19, 1990. The samples were gathered between June 27 and August 31. Originally it was planned to sample six points and to split all samples between the interested parties. During the sampling effort conducted on June 27, hydrocarbon samples were successfully obtained and split between IEPA, Shell, Clark, and Amoco from the following wells:

* Clark Recovery Well 1, West Forest and Delmar;
* Clark Recovery Well 2, East Cherry and Olive;
* B-16 , [redacted] East Cherry St. ([redacted] residence);
* Shell Rand Avenue recovery system, Rand & Olive.

Only IEPA received a sample at the following monitoring well where insufficient sample was obtained to split:

* B-31 , [redacted] West Birch ([redacted] residence).

Due to an error in a preliminary measurement by Shell personnel, one well was not sampled as planned on June 27 because it was believed that no free phase product was present. Subsequently this error was discovered and that well was sampled on July 17 and split between IEPA, Shell, Clark and Amoco. That well was:

[redacted]

data was compared as well as the data documentation submitted by each of the committee participants.

Shell submitted additional written comments (Attachment 13) saying that the chromatography results indicate the hydrocarbon from Clark recovery wells 1 and 2 and well B-16 is essentially the same hydrocarbon. Each one of the samples contain a significant amount of alkylate (a gasoline blending component) as shown in the mid-range of the traces (seven- and eight-carbon paraffinic isomers). The hydrocarbon from Shell's Rand Avenue spill site, Shell Tannery well (EPA-7), and the ARCO/Sinclair pipeline do not contain the seven- and eight-carbon paraffinic isomers indicating the hydrocarbon from these wells does not match that found in Clark recovery wells 1 and 2 and B-16.

The lead content and alkyl lead isomer distribution results showed that the hydrocarbon samples from Clark's recovery wells, B-16, and Shell's Tannery well (EPA-7) contained a significant amount of lead with the major alkyl lead isomer found being tetraethyl lead (TEL). Shell's Rand Avenue spill well and the sample from the Sinclair/ARCO pipeline contained no detectable lead compounds.

[redacted] Alkylate is a gasoline blending component which is produced by the acid-catalyzed condensation of three-carbon and four-carbon olefins with four-carbon paraffins to yield significant amounts of seven- and eight-carbon branched paraffinic isomers. There are two alkylation processes used in the refining industry to manufacture this blending component. Each uses a different acid in the catalyzing step. The acids used to catalyze the reaction are concentrated sulfuric acid ($H_2SO_4$) or concentrated hydrofluoric acid (HF). The predominant isomers produced are 2,2,4-trimethylpentane (224TMP), 2,3,4-trimethylpentane (234TMP) and 2,3,3-trimethylpentane (233TMP). The major isomer is 224TMP.

There is a difference in the ratio of the 224TMP to the sum of the 234TMP + 233TMP which is dependent upon which acid is used in the catalyzing process. These ratios have been documented in the following literature references. An article by Cupit, Gwynn and Jernigan in Petro/Chem Engineer, December 1961, Table 6 show the ratio to be 0.98 for $H_2SO_4$ alkylate and 2.14 for HF alkylate. Another article by Vahlsing in Hydrocarbon Processing, September 1968, page 246, Table 1 show the ratio to be 1.20 for $H_2SO_4$ alkylate and 2.33 for HF alkylate. Langlen and Pike in AIChE Journal, July 1972, page 702, Table 4 show that the ratio from nine experiments on $H_2SO_4$ alkylation varied from 0.75 to 1.11.

HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

PUBLIC WATER SUPPLY WELLS

As of the date of this report there is no conclusive evidence that the hydrocarbon plume under the northern portion of the village of Hartford has affected the public water supply wells. These wells are located on the west side of the village along Old Saint Louis Road and south of Hawthorne. The village routinely sends samples from the public water supply to a commercial laboratory for analysis. On February 23, 1990 they did this and the commercial lab reported finding Benzene, Ethylbenzene, Toluene and Xylenes (BETX) in samples from supply wells 3 and 4. Resamples by the IEPA did not confirm those results (Attachment 14). [redacted]

On the other hand, the Hartford public water supply wells have had reoccurring findings of para-dichlorobenzene and mono-chlorobenzene at very low levels. The first samples tested for these were taken in 1986 and showed 14 ppb (parts per billion) of mono-chlorobenzene and 4 ppb of para-dichlorobenzene. Follow-up monitoring has been conducted on a quarterly basis. The contaminants have persisted on a marginal basis in PWS well #4 and appear intermittent in PWS well #3. [redacted] NICOR is a service company that cleans out barges which transport various materials on the Mississippi River. Chlorinated solvents are frequently handled by the facility. NICOR is regulated under RCRA (Resource Conservation and Recovery Act) hazardous waste regulations. Waste samples collected by the IEPA at NICOR indicate that mono-chlorobenzene is a constituent of NICOR's waste. The IEPA did not analyze the samples for paradichlorobenzene. Attachment 15 contains the IEPA's sampling results.

Another potential source for the chlorobenzene and paradichlorobenzene constituents is an old city landfill which the Mathes report in 1978 identified as being located between Route 3 and the Mississippi River east of Hartford.

[redacted]

HARTFORD UNDERGROUND HYDROCARBON INVESTIGATION

[redacted]

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